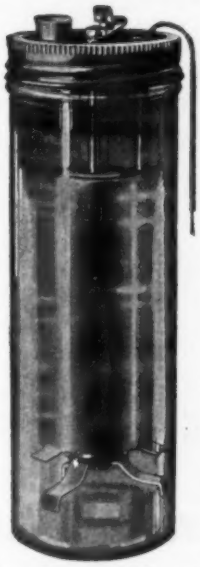
Telephone Engineer

FEB 20 1930

Engineering Library

USE WATERBURY TELECELLS FOR TELEPHONES



THEY LAST LONGER

For—
Dependability, Long Life and Economy

THE WATERBURY BATTERY COMPANY
WATERBURY, CONN.

SANDS ELECTRIC CO.

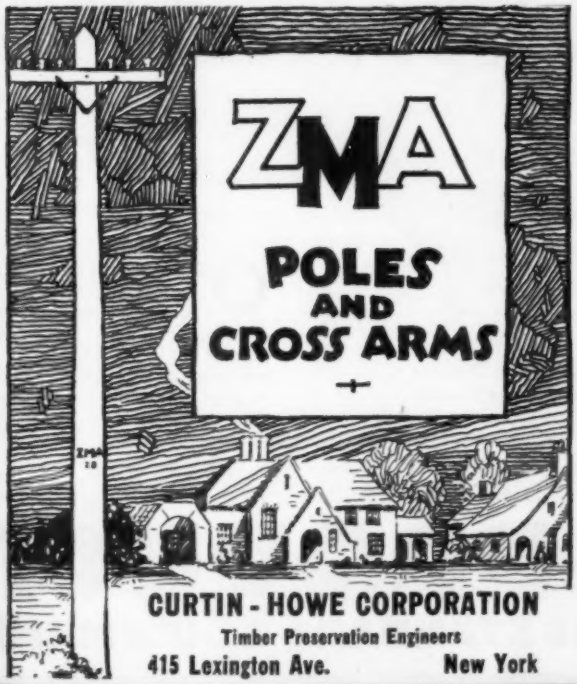
The Standard of the Modern Plant

No. 50. Unprotected Terminal

Made in 11, 16 and 26 Pair

"Use Is the Proof"

Sands Electric Co.
North Chicago, Illinois



CURTIN - HOWE CORPORATION
Timber Preservation Engineers
415 Lexington Ave. New York

HOLDING POWER!!

The Essential Factor When Anchors Are Being Specified

KEARNEY TELEPHONE UTILITY SPECIALTIES

GUY WIRE CLIP

SOLDERLESS SERVICE CONNECTOR

STEEL ROD SCREW ANCHOR

PIPE ROD SCREW ANCHOR

FOR the telephone companies use, Kearney Engineers have designed solderless service connectors, guy wire clips, steel rod and pipe rod screw type anchors, and cable ring saddles. These products show exceptional economy over older methods used. Write today for bulletins covering the above products.

DEPENDABLE anchorage year after year is essential. That is why holding power is the factor which brings the ultimate decision for anchor selection. In Kearney Hi-Tension 4-in-1 Expansion Anchors, you will find the answer — they have a greater holding power than any other anchor of equal inches of surface. Tests on any of the four sizes of these anchors will back up this statement —they are all made of certified malleable iron; guaranteed against breakage.

Holding Power of Kearney Hi-Tension 4-in-1 Expansion Anchors

Cat. No.	Sand	Clay	Hard Pan
6076	4,000	8,000	12,000
7104	6,000	12,000	16,000
8136	10,000	16,000	20,000
10208	16,000	24,000	32,000

OTHER features of Kearney Hi-Tension 4-in-1 Expansion Anchors include: Ease of installation, capable of being installed in any kind of soil, at any angle, to any depth, and in any location.

Bulletin No. 301 covering Kearney Hi-Tension 4-in-1 Expansion Anchor will be sent on request.

JAMES R. KEARNEY CORPORATION
4228 CLAYTON AVENUE ST. LOUIS, MO.

A KEARNEY PRODUCT

BEING ADOPTED NATIONALLY AS STANDARD EQUIPMENT

TELEPHONE ENGINEER, February, 1930. Volume 34, No. 2. Published monthly by TELEPHONE ENGINEER. Publication office, 192 N. Clark St., Chicago, Ill. Subscription price $2 a year in the U. S. Entered as second-class matter June 6, 1922, at the Post Office at Chicago, Ill., under act of March 3, 1879.

"SPEAK LOUDER... I CAN'T HEAR YOU!"

Teletype ends the danger of misinterpreting 'phone messages because of noisy surroundings

At last the difficulty of understanding telephone conversations because of noisy surroundings has been ended. Thanks to Teletype . . . the Telephone Typewriter . . . it now is possible to send *typewritten* messages over ordinary telephone circuits.

As an example of Teletype's usefulness, suppose you have a subscriber who is obliged to maintain communication between his office and a noisy plant. With a Teletype at either end he can exchange printed messages at the rate of 60 words per minute. Figures, hard-to-understand names and addresses, formulas, specifications . . . all will be recorded with absolute accuracy.

Teletype is the only device that sends typewriting by wire. Depressing a key on the sending machine causes both the sending and receiving machines to print that letter or figure . . . instantly! Errors in transmission are virtually impossible, as the sender has only to look at what he or she is typing in order to see what is being printed at the other end.

Another advantage of Teletype is that it provides a record for filing at both ends. Thus it combines the speed and convenience of the telephone with the authority and permanency of the printed word.

Years of use by telephone and telegraph companies, railroads, press associations and industrial organizations have proved the efficiency and dependability of Teletype beyond question. It is extremely simple to operate . . . any typist can use it.

This is the Page Teletype, which prints its messages on the ordinary typewriter page.

Join the hundreds of telephone companies that are providing their subscribers with Telephone Typewriter Service at excellent profit to themselves. The coupon below brings complete information . . . mail it *now!*

TELETYPE

THE TELEPHONE TYPEWRITER

MAIL FOR FURTHER FACTS

For full information concerning the Telephone Typewriter and its cost, sign this coupon, pin it to your letterhead and mail to the TELETYPE CORPORATION, 1400 Wrightwood Ave., Chicago.

Name _____

Position _____ TE-2-30

TELEPHONE ENGINEER

192 N. Clark St., Chicago. Telephone STAte 8971

PUBLISHED MONTHLY BY

TELEPHONE ENGINEER PUBLISHING COMPANY

J. A. SMITH, 192 N. Clark St., Chicago, President and Treasurer — C. L. JONES, Athens, Ohio, Vice-President

D. WEINER, 192 N. Clark St., Chicago, Secretary — F. A. BOWDLE, Cerro Gordo, Illinois, Vice-President

HAROLD L. BEYER, Chicago, Vice President

Vol. 34 No. 2 — February 1930

SUBSCRIPTIONS:—The subscription price of TELEPHONE ENGINEER is $2.00 a year in the United States, Cuba and Mexico; in Canada it is $3; in all other countries $4. Single copies, U. S. A., 20 cents.

Entered as second-class matter, June 6, 1922, at the post office at Chicago, Ill., under the act of March 3, 1879

Table of Contents

Editorial 15-16

Let the Radio Channels Be Conserved—Straightforward Trunking—The Unordered Goods Racket—The Baltimore Street Railway Rate Case—A Good Year in Prospect.

Studying Telephone Methods, by E. R. Collins 17-18-19-20-45

Fundamental Conception of Carrier Currents, by F. J. Dommerque 21-22-28

Line and Desk 23

Annual Meeting of American Electric Co.; Officers Elected 27

Annual Meeting of Automatic Electric, Inc.; Officers Elected 28

Underground Cable Construction, by Ray Blain 29-30-32-34

G. A. Yanochowski New Kellogg President 36

Independent Telephone Industry to Spend Millions in 1930 36

Selects Stromberg-Carlson Equipment 38-40

With the Manufacturers 42

Index to Advertisers

A

American Cross Arm & Conduit Co. 33
American Electric Co., Inc. 4
American Telephone & Telegraph Co. 13-31
Automatic Electric Co. 5
Atlantic Hotel 37

B

Bell Lumber & Pole Co. 33
Berry, L. M. 45
Blake Signal & Mfg. Co. 44
Block, Lynton T., & Co. 8
Bowdle Accounting System 10
Buckeye Telephone & Supply Co. 46

C

Carbon Products 12
Chance Company 41
Cleveland Trencher Co. 32
Coffey System & Audit Co. ..... —
Cook Electric Co. 14
Curtin-Howe Corp. 1

E

Earl L. Carter 46
Electric Storage Battery Co. 44
Everstick Anchor Co. ..... —

G

Great Northern Hotel 45
Graybar Electric Co. 7-37

H

Herdrich & Boggs 45
Holtzer-Cabot Electric Co. 41

I

Indiana Steel & Wire Co. 37
International Creo. & Con. Co. 48

K

Kearney Corp., Jas. R. 2
Kellogg Switchboard & Supply Co. 6
Kestor Solder Co. 41

L

Lorraine Hotel 41

M

MacGillis & Gibbs 33
Minnesota Electric Co. 45
Miller, Wm. M. ..... —
Monterey Hotel 39

N

National Cable Compound Co. 44
National Carbon Co. 11
Naugle Pole & Tie 33
Northern White Cedar Ass'n 12

P

Prest-O-Lite Co., Inc. 39
Prettyman & Sons, J. F. 47

R

Rebuilt Electric Equipment Co. 46
Reliable Electric Co. 3

S

Sands Electric Co. 1
Signal Eng. & Mfg. Co. 43
Stewart Bros. 10
Stromberg-Carlson Tel. Mfg. Co. 24-25

T

Telephone Repair Shop 45
Teletype Corporation 9
Telkor, Inc. 12
T. M. Partridge Co. 33
Templeton-Kenly Co. 33
Texas Creosoting Co. 10

U

Universal Specialty Co. 46
Unique Mfg. Co. 46

W

Welker, J. H. 45
Western Electric 35
J. G. Wray & Co. 45

CONVENTION SCHEDULE.

Georgia Telephone Association, Ansley Hotel, Atlanta, February 14.

Oklahoma Utilities Associatoin, Tulsa, New Tulsa Hotel, March 11, 12 and 13.

North Dakota Telephone Association, Grand Forks, Hotel Dakotah, March 11, 12 and 13.

Texas Independent Telephone Association, annual convention, Hotel Texas, Fort Worth, March 18-21, 1930.

Iowa Independent Telephone Association, Des Moines, Hotel Fort Des Moines, April 8, 9 and 10.

Ohio Independent Telephone Association, Columbus, Deshler-Wallick Hotel, April 15, 16 and 17.

Indiana Telephone Association, Indianapolis, Claypool Hotel, May 6, 7 and 8.

Kansas Telephone Association, Topeka, Hotel Jayhawk, May 13, 14 and 15.

Up-State Telephone Association of New York, Rochester, May 21, 22 and 23.

Pennsylvania State Telephone & Traffic Association, Penn-Harris Hotel, Harrisburg, May 13, 14 and 15.

"STEWART" DETECTO-METER

The "STEWART" Detecto-Meter is guaranteed to locate those bad joints that are sure to give trouble in hot weather. One Illinois company cut out two, one bushel crates of bad wire joints all showing resistance. They brought their lines up in transmission, beyond belief.

The Detecto-Meter will also measure resistance of any part of switchboard or telephone. It has more than 100 uses around the telephone plant. It is also a 150-volt voltmeter. Sent on trial. Price $39.00.

Also lineman's Test Sets with detector coil, Cable Testers and Test Cabinets.

STEWART BROTHERS, Ottawa, Illinois

"BLACK BEAUTY" POLES

Cost less per mile, per year, than untreated poles of any species.

American Electric Company, Inc.

Distributors of "Black Beauty" Poles and Cross Arms to the Independent Telephone Trade

State and 64th Streets : : Chicago, Ill.

Branch Office and Warehouse: 622 Wyandotte St., Kansas City, Mo.

Investigate Our Centralized Accounting Plan

This monthly Audit will save you lots of money and give you important information that you should have about your business—the best of all business, if properly managed.

BOWDLE ACCOUNTING SYSTEM

CERRO GORDO ILLINOIS

Telephone Engineer

Volume 34 FEBRUARY, 1930 No. 2

Let the Radio Channels Be Conserved

It has been said that the only places out of reach of the telephone are the great wildernesses of the earth or the middle of the ocean. There may still be wildernesses inaccessible to the telephone, but the middle of the ocean certainly no longer is. The recent inauguration of commercial telephone service between New York and the Leviathan has definitely extended telephone service to the middle of the ocean.

While the calls on the outward voyage may have been the result of curiosity, unofficial reports indicate that there was a considerable amount of commercial traffic on the return trip. Travelers need no longer be cut off from their business or friends for several days during an ocean voyage and it seems that they have appreciated the service to the extent of making use of it.

It is not wild imagination but reasonable certainty that the time will soon be here when every large liner will be equipped with commercial radio telephone apparatus and that shore stations will be located at the ends of the great steamship lanes of the seven seas.

The demand for channels in the radio spectrum for these mobile services will be increasing instead of decreasing. Those who have to do with the assignment of channels should take this into account in order that the limited space available in the ether may not be pre-empted by point-to-point radio systems between locations that might as well or better be served by wire channels.

Straightforward Trunking

One of the outstanding developments of manual switching during the past decade has been the development of the straightforward method of trunking. Coming at a time when many of the larger multi-office exchanges were already in the process of conversion to automatic operation, it would seem that such a radical change in manual operation would not have found wide application. Yet, according to figures recently given in Bell Telephone Quarterly, the method is now in use in about 7000 positions of "B" switchboard in thirty of the largest centers.

It has been applied not only to the new manual offices but to old offices that will be superseded within a very few years and to operation of trunks from manual to dial offices. Its wide adoption is additional evidence of the willingness of the telephone industry to scrap old methods and old equipment for more modern and serviceable methods even in some cases where the new method is certain to be supplanted by still other methods within very few years.

On account of this important development, it is with some pleasure that we present in this number and in succeeding numbers a series of four articles by two traffic engineers who have contributed materially to the development and application of the method. Mr. Stonaker and Mr. Costich will contribute not only a story of the operation of various straightforward trunking systems but will present valuable traffic and cost data, which we are sure will be of wide interest to telephone men.

The Unordered Goods Racket

One of the nuisances of modern direct mail selling is the shipment of unordered goods by mail or parcels post. The Christmas season is the favorite time and Christmas cards are the favorite commodity for such concerns. However, they do not limit themselves to one season or to one item of merchandise. At other seasons, there are pencils, neckties, hosiery, cheap jewelry and other knick-knacks.

Many people fall for this game because they do not care to go to any trouble about it and send in the amount requested rather than go to the trouble of returning the goods. Others accept and pay for the goods because they do not know that they are not compelled to do so. Almost always the goods

are inferior to those which can be purchased from local dealers at the same or a smaller price.

The law regarding the obligation of the recipient of an unordered shipment is definite enough that no one need be the victim of such a racket. Any competent lawyer or the better business bureau can tell an inquirer what to do.

We are led to these remarks by what seems to be an increasing effort to victimize the telephone operating forces. A surprisingly large amount of mail of this character comes to the chief operator of almost every telephone office. If every telephone manager will familiarize himself with the law and then instruct his chief operators how to handle such matters, the profits of the unordered goods racketeers will soon drop to the point that the telephone offices will be crossed off from the lists of prospective suckers.

The Baltimore Street Railway Rate Case

The decision of the United States Supreme Court in the rate case of the United Railways and Electric Co. of Baltimore again affirms the position of the Supreme Court that rate levels must be established which will provide a fair return on the value of the investment. Accepting the agreed valuation and the computations of return, the majority opinion delivered by Mr. Justice Sutherland held that a rate of return of 6.26 per cent was confiscatory and stated that the rate should be well up toward 8 percent.

This part of the decision being in line with other decisions does not add much to the law of the situation. A more interesting feature of the case was the decision in which the majority opinion held that depreciation should be computed on present value rather than cost of the property. As pointed out by Mr. Justice Brandeis in the dissenting opinion concurred in by Messrs. Justice Holmes and Justice Stone, this is at variance with ordinary accounting practice and especially with the practice followed over a long period of years by telephone companies.

Disregarding the logic of the case—and there are differences in applied logic even on the Supreme Bench of the United States as is evidenced by four to three decisions—it would seem that there are practical difficulties in the way of using present value in computing depreciation charges for monthly entries on corporation books. Present value is a continually changing thing that may or may not be reflected by the figures on the general ledger. General ledgers are not supposed to show elements of judgment which are inevitably present in the determination of present value of utility property. They are supposed to represent costs, and in case of telephone properties which have been carrying adequate book accounts over a long period of years do fairly reflect the actual costs of the property.

As we see it, the decision will make little difference in the practical handling of depreciation. The accountant will have to compute his monthly figures and he will use the book costs as he has always done. The public service commission will have to determine depreciation allowance in rate cases and it will use present value as it has done in most of the rate cases with which we are familiar. The engineer will have to determine rates of depreciation and he will compute his figures on expectancy of life of various elements of plant just as he has always done.

When all of these are done, the executive, taking the broad view that both the interest of the stockholders and the service to the public must be protected, will check up periodically and by the exercise of sound business judgment determine whether the accumulations in the reserve are such that they provide adequate protection to the stockholders and the service without an unjust charge against the customer.

A Good Year in Prospect

Reports coming to this office from manufacturers and operating companies in all parts of the country, continue to forecast that 1930 will be a year of real advancement in the telephone industry. Of course, any year of normal replacements in a business the size of the telephone will provide no small volume of sales to manufacturers and supply dealers.

The present year will be more than one of normal replacements of a business that has reached its full growth. In the first place the business has not reached its ultimate stature and, again, it is not a business that is content to go along merely on a replacement basis. It is a business in which the ideal of a bigger and better service demands something more than making good worn-out plant.

Reacting to this ideal, telephone management has made its plans not only to replace worn-out equipment but to substitute better and more serviceable plant. More modern switchboards, stronger and longer lived poles, more durable construction of all kinds are in the program all over the country.

The telephone has a record that there has never been a decrease in volume of business in the country as a whole. The worst that has happened to it in the years of worst commercial depression has been a slackening of growth. There is little indication that 1930 will witness even a falling off of the rate of growth. It certainly will not with everybody in the business going along with heads up to make it another year of progress.

Studying Telephone Methods

This Is Chapter 36 of a Series of Articles on Studying Telephone Methods, Written by E. R. Collins of the Manitoba Telephone System, Brandon, Manitoba, Canada

The 100 Line Connector System.

The Connector Circuit studied in the previous chapter is used in place of the calling cord to call the subscriber's telephone. Since only 100 points are connected to the connector bank, it follows that there can be only one hunlred telephones served by the connector alone. In this chapter we will try to get a better understanding of the uses on this device, and the methods of connecting it into a system. Possibly no better method can be followed than to compare the connector with the circuits of the Manual system with which we should be all familiar. Unfortunately the impression among many men seems to be that the operation of telephones by the Dial method involves a different method of operation as far as the maintenance man is concerned. If we will only apply the knowledge we already possess concerning the Manual operation, of the common battery system, to the maintenance of the Automatic type, much of the mystery will disappear.

For example, we have in Figs. 278, 279, 280 and 281 four drawings which are very similar in appearance. If we will compare these point by point, we will find that we are already in possession of information regarding the connector system.

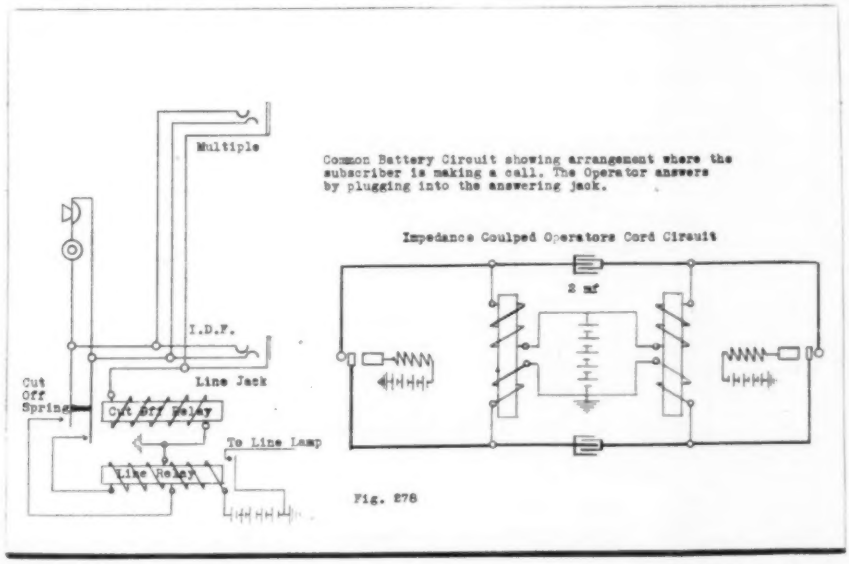

Multiple
Common Battery Circuit showing arrangement where the subscriber is making a call. The Operator answers by plugging into the answering jack.
Impedance Coulped Operators Cord Circuit
2 mf
I.D.F.
Line Jack
Cut Off Spring
Cut Off Relay
To Line Lamp
Line Relay

Fig. 278

In Fig. 278 we have the line and cutoff relay of a common battery line. The line relay set is connected to the intermediate frame and from there is connected in turn to the line jack and the multiple jack. The I. D. F. therefore gives a convenient place for terminating of the subscribers' line, the multiple jacks and the line jack and line relay circuits. It also provides a very convenient place to test for trouble. In Fig. 278 the subscriber is making a call. The receiver is lifted from the hook, the line relay finds a circuit through the subscribers' telephone, the line lamp lights, and the operator picks up a back or answering cord, and inserts the plug in the line jack. This connects the tip and ring of the plug to the tip and ring of the subscriber's line jack, also completes the sleeve connection. The sleeve connection is naturally completed before the tip and ring contact are completed, therefore the cutoff relay circuit is completed. Battery supplied through a resistance through the sleeve conductor operates the cutoff relay. This opens up the cutoff springs as shown in Fig. 278, and cuts the line relay away from the line. The line relay armature releases, and the line lamp goes out. The subscriber's transmitter is now supplied from the balanced impedance coil in the operator's cord circuit. Up to this time the only operation the subscriber has made is to lift the receiver from the hook. The operator so far has only selected an *idle cord circuit and inserted the answering plug into the line jack.* The calling cord is connected to the answering cord through the switchboard wiring and both plugs appear close together before the operator.

In Fig. 279 we have an arrangement of a line switch consisting of the line relay and the bridge cutoff or B. C. O. relay. The pull down coil is also included in the B. C. O. coil, but is omitted here for simplicity. Connected to the line switch terminals are the wires leading to the line switch bank associated with this line switch. So far we have the equivalent of the line and cutoff relay set of Fig. 278, and also the line or answering jack. The line lamp operation calls the operator's attention, but in this case the line relay closes the circuit to the pull down coil of the line switch and causes the plunger to operate. Now in Fig. 278 the operator selected an idle cord circuit from her set of cords, *after the line lamp had lighted.* But in Fig. 279 we must remember that the master switch has previously set all unoperated line switches before an idle trunk. Therefore the cord or trunk circuit in this case is selected before the subscriber removes the receiver. Whereas the operator may have 10 or more cords to choose from, the line switch is limited to 10 cord circuits or as we now call them trunk circuits. When the receiver is lifted from the hook, as in Fig. 279 therefore, the plunger will drive into the preselected trunk, and connect the contacts of this particular line switch bank with the contacts of the trunk selected. The master switch as already explained will move all other line switch plungers to the next idle trunk. Now at the same time the plunger is pulled in, the B. C. O. armature is pulled in and opens up the line cutoff springs. This cuts the line relay and ground away from the line and battery is now supplied from the "A" relay of the connector. If you will refer to Fig. 279 you will note that there is something wrong with the arrangement. Negative battery is supplied from the line relay to the upper bank contact of the line switch. Now follow out the same line to the "A" relay of the connector and you will note that the positive of the "A" relay winding is connected to the negative side of the line switch bank. If the plunger was shoved in part way by hand, battery from the line relay would flow over the B. C. O. contact, over the closed trunk to the positive side of relay "A." This would cause "A" to pull in. The negative winding of relay "A" would also find a circuit back over the closed trunk to the ground at the B. C. O. contacts, and would help "A" to pull in. This would ground relay "B" of the connector, grounding its contact and thus the release trunk and would pull up the B. C. O. armature, causing the circuit to be

opened to the line relay. This would cause a fluttering back and forth of the line relay and the B. C. O. coil. The negative side of the line switch bank contacts should face the negative side of the connector trunk. Therefore the trunk wires in this drawing should be reversed. The subscriber up to this point has not operated his dial, and the progress so far corresponds to the progress made in Fig. 278, where the operator has only placed the answering plug in the line jack. In Fig. 279 we have then the equivalent of a pair of cords. The line switch banks corresponding to the answering plug and the line jack, with the connector and its relays, and wipers corresponding to the calling cord and its plugs and keys, etc. Battery is supplied to the calling subscriber from the balanced impedance of the "A" relay of the connector, as in a similar manner to that shown in Fig. 278. The I. D. F. connections are rellaced by a set of terminals as shown in Fig. 279. These will be explained more fully as we proceed.

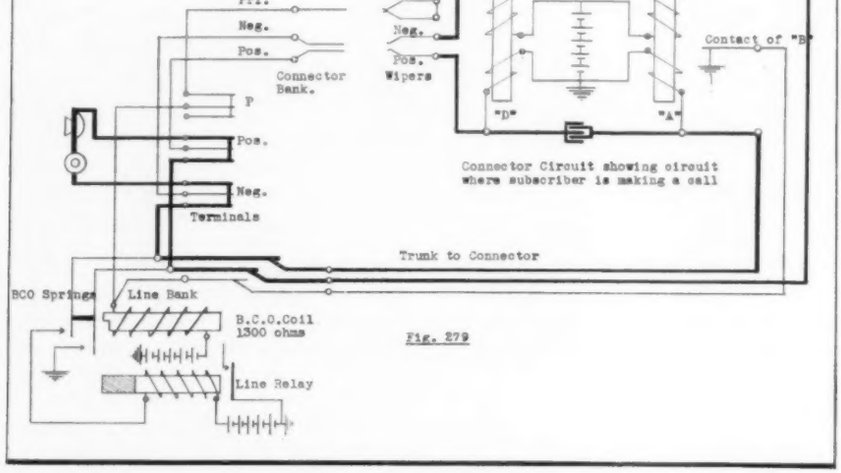


Fig. 279

In Fig. 278 and 279 we had comparative methods of making a call. In Fig. 280 and 281 we will see what takes place in receiving a call. In Fig. 280 the cord circuit is shown facing the multiple jack. We will assume that the operator has a subscriber already connected to the right hand cord which now becomes the answering cord. The tip of the calling cord is touched to the sleeve of the multiple jack. If negative battery is on this sleeve from another connection, the operator received a click in her receiver as explained in a previous chapter. If the line is not busy, the tip of the plug and the sleeve of the jack will be of the same polarity or potential, and no click will be heard by the operator. The plug is inserted into the multiple jack, and this being in multiple with the line jack and line relay equipment, the line cutoff relay will pull up and cut the line relay away from the subscriber's line. The battery to the transmitter will now be supplied from the balanced impedance of the operator's calling cord. The two cords are connected with 2 M. F. condensers for the passage of the voice frequencies. Failure of the sleeve circuit in any part would not supply battery to the cutoff relay. This would leave the line relay connected to the line at the same time as the battery from the cord circuit. Negative battery would flow from the line relay, over the cutoff springs, which we suppose are not opened, to the telephone, and pull up the line relay and light the line lamp. Then battery would also flow over the tip of the line to the positive side of the cord relay, causing it to operate. This operation would be reinforced by the circuit of the negative side of the cord relay flowing back over the ring to the circuit to the positive side or ground of the line relay. A reversal of the battery arrangement at the line relay would still allow the line lamp to remain lighted, but since there would be negative battery on both the tip of the cord and the tip of the jack, and also positive battery on the ring of the cord and ring of the jack, the supervisory lamp in the operator's cord circuit would also be burning, since its supervisory relay would not pull up due to the similar polarities of the line and cord. Of course this condition only prevails where the sleeve circuit failed to pull up the cutoff relay. Aside from that, however, if the battery is arranged as shown in Fig. 280, the subscriber would receive a loud bang in the receiver, because his set would be receiving battery of one polarity from the line relay, but this would be reversed when battery from the cord circuit is applied. Therefore the drawing in Fig. 280 is wrong, and the logical correction would be to change from the direction of the battery feed at the line relay. If we reversed the battery at the cord circuit, we would interfere with the proper operation of the busy test.

Well there we almost got off the track, didn't we? Let us now look at Fig. 281. Here the telephone shown is being called from a connector. It is assumed that there is a telephone connected through its line switch as shown in Fig. 279, to operate the connector. The calling telephone is receiving battery from the "A" relay of the connector, and the dial has operated the connector to connect its wipers to the line called in Fig. 281. In this case the wipers take the place of the calling plug of the cord circuit, and the connector bank contact takes the place of the multiple jack shown in Fig. 280. The "H" relay of the connector operates from battery supplied through the 1300 ohm winding of the line switch B. C. O. coil. Just the reverse arrangement of Fig. 281 where the battery is supplied from the resistance in the sleeve of the cord circuit. The B. C. O. operates and opens up the B. C. O. spring, thus clearing the line from line relay and ground. If you will refer back to the drawing 277 in

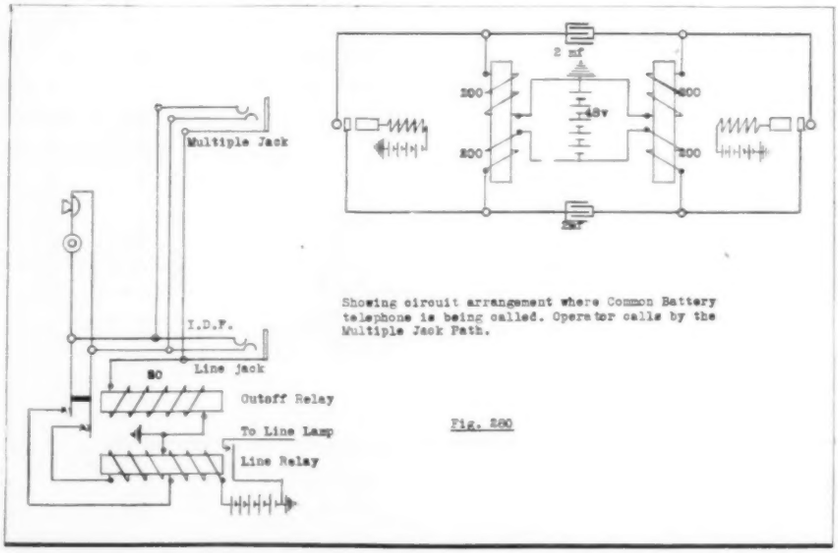


Fig. 280

last chapter you will notice that the "H" relay has the wiper circuit opened until it has operated. When the connector stops on an idle bank contact the "H" relay first finds negative battery from the B. C. O. coil. Then the B. C. O. operates its full stroke immediately, and cuts the line away from the line relay and ground. But relay "H" has to take two bites to operate. First, the 125 ohm winding operates springs 1 and 2 of its spring assembly and pauses, because that is all the strength it has. When these two springs come in contact they close the second winding of "H" and that gives the second bite and over the armature goes. The positive and negative wipers are connected to the outside set of springs of the assembly of relay "H," so that the springs between them and the armature must take up all their slack before the last pair of wiper contact springs close. While all this

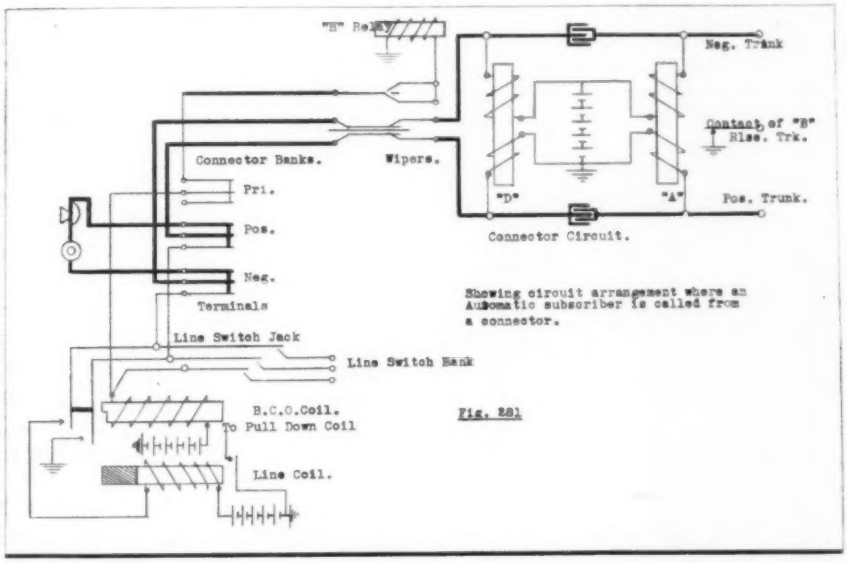


Fig. 281

happens in a fraction of a second, there is enough difference in time to allow the B. C. O. springs to clear the line before the wipers are connected to the battery from relay "D" of the connector. Now if you will trace the negative battery from the line relay to the connector bank and also the negative battery from relay "D" of the connector, you will see that the negative wiper connects to the negative bank contact. If the wipers were reserved, then the telephone having received one polarity from the line switch would receive an opposite polarity from the connector. This would have the result of making the called subscriber's bell tingle as soon as the wipers connected with the line. Suppose the connector hit the line just after an automatic ring period. Then the bell would tingle due to the battery reversal in the telephone condenser and then the regular ring would follow. Or suppose some one called a line and immediately hung up again before the bell was supplied with ringing power. The called subscriber's bell would tingle, and if the subscriber answered there would be no one there. Reversed polarity in such cases is bad business. The heavy lines in Figs. 279 and 281 show the path of the talking currents.

Arrangement of Trunks.

We have already noticed that there are only 10 trunks to a subscribers' line switch bank. This means that for a group of 100 lines controlled by one master switch there would be 100 line switches all able to use any one of the 10 trunks. The contacts of the line switch bank connected to the subscribers' line are for the use of that one telephone. Therefore they can all be connected as one. In fact they are stamped out of one sheet of metal. In appearance they look like a horse comb in a curved form. In Fig. 282 the telephone lines are shown horizontal, only three of the 10 sprongs being shown. Therefore the horizontal contacts are electrically as one, and connect to the line wired to them. Each line switch bank is a separate unit, and the common connection for the line contacts is accomplished by the one piece of metal. But the trunks must also be commoned. Therefore the first contact of each line switch bank is connected by wire to the first contact of every other line switch bank of that particular group. In the same way the second trunk is connected by wiring to the second set of contacts of every line switch bank and so on. This means that while the line contacts are multiplied in sets of 10 for each line switch bank, the trunks for a 100 line group would be multiplied to the 100 sets of contacts of the line switch banks. The arrangement of trunks in relation to the lines is shown in Fig. 282.

Now refer to Fig. 284. Here we have a sketch of the layout of a 100 line automatic board. The line switches are set out in 4 groups of 25 lines each. These groups are lettered A-B-C-D. The master switch in use in Fig. 284 is marked "B." There is room for 4 master switches as shown by the dotted lines. This means that with one master switch all the master switch guide shafts are locked together. The guideshaft for sections "A" and "B" are locked together by a link device set in the end of the shaft, one above the other. The guide shafts for sections "C" and "D" are likewise locked together as one. Then the left sections "A"-"B" are connected to the right hand sections "C"-"D" by cross connecting links.

Suppose a second master switch is needed, it can be mounted at position "D" and the cross connecting links removed. This allows sections "A"-"B" to be operated by master switch "B" and sections "C"-"D" to be operated by master switch "D."

It will be noticed that the lines from section "A" are shown wired to No. 2 of the terminal assembly above. Section "B" is wired to terminal assembly No. 3. Section "C" and "D" are also each wired to their respective terminal assembly positions.

Terminal Assembly.

The method of terminating lines can be one of several types. One of the most unique types is shown in Fig. 283. The ordinary type of terminal block is quite well known to all telephone men, but this particular method is peculiar to the automatic equipment. The terminal strip consists of a piece of specially constructed fibre. A terminal strip is shown in Fig. 283. The top part of the drawing shows four strips placed one above the other. The brass strips are bent down through slots punched in the fibre,

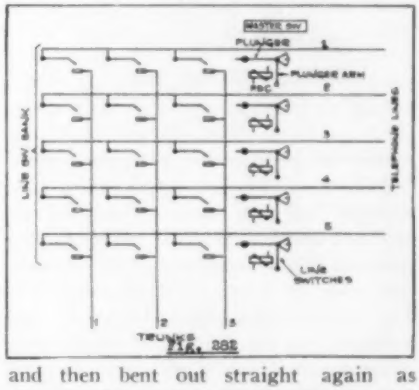


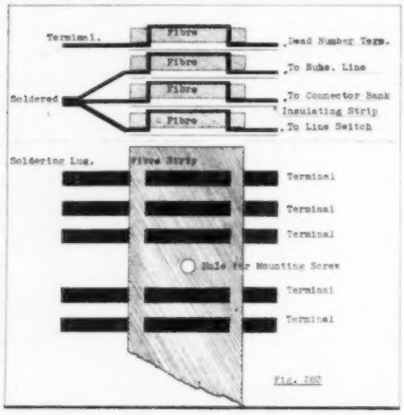
Fig. 282

and then bent out straight again as shown. One end of the terminal is used to attach the cable wire to, while the left hand end is used for connecting adjacent terminal lugs together. The lower part of the drawing shows a face view of a terminal. These are made up in strips of 100 terminals, in 5 groups of 20. Between each group is a hole through which a bolt is passed. As shown in the upper part of the drawing there would be a strip of insulation, then a terminal strip, another insulator, another terminal, and so on. A pile can be built up several high, and then after the pile is com-

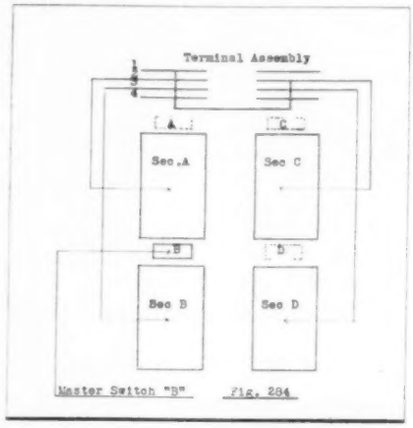
pleted, a heavy strip of insulation, and then an iron strap are placed and the whole clamped down with nuts on the 6 bolts. In the upper part of the drawing 283 we have shown the terminals associated with a subscribers' line. These are shown in Fig. 279 and 281. Normally each line would have 3 sets of terminals, the negative, the positive and private. The negative and positive are used to connect the subscriber's line, the connector bank and the line switch together. The cables are brought respectively to their contacts as shown in Fig. 283, upper section. Then the left end of the terminals is bent into position as shown and soldered. For testing purposes, a hot iron is applied to the left of the terminals and the three terminals spread out. Then the trouble can be localized in either the subscriber's line, the connector bank, or the line switch. In Fig. 281 it will be noticed that we have shown 3 terminals for the private. Only two are shown used. It is usual practice to only supply the two terminals, as only the connector bank private and the line switch private are joined together at this point.

Dead Number Trunk.

There is a terminal shown on Fig. 283 at the top as dead number term. If a



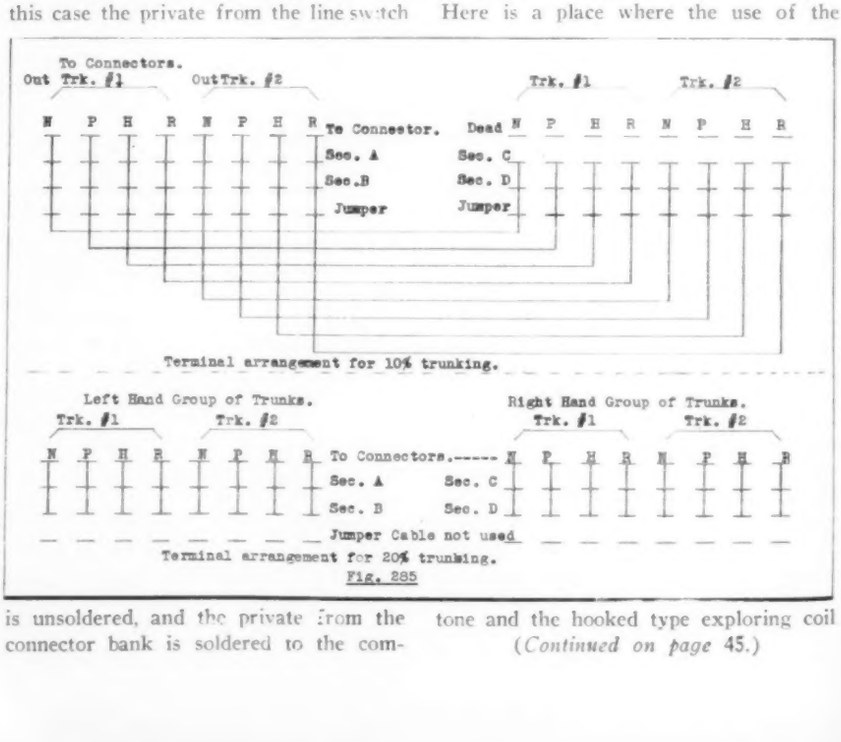
telephone is disconnected or taken out, the line will ring open. Where desired, all dead telephones can be connected to a common line terminating on an ordinary telephone, or a special trunk circuit before an operator. The terminals are unsoldered and the line switch bent down, while the connector bank and the subscriber's line terminals are bent up and soldered to the dead number terminal. The dead number terminals are multiplied through the strips for the 100 lines, so that any number of the lines may be connected to the dead number strip. The positive and the line terminals are connected to the dead number terminals, and thus to the telephone or trunk. But it must be remembered that the connector must find negative battery on the private of any line called. So the B. C. O. of the line switch is left connected to the private of its line on the connector bank. This means, however, that if more than one dead telephone is called that two or more connectors calling dead numbers could all get in on the dead number trunk. This might lead to confusion. To prevent this there is a common dead number terminal appearing over the private terminal of each line. This can be soldered to each dead number. Then if a subscriber calls a dead number the common private soldered to



the privates of all other dead numbers will be grounded. Any second connector that calls the dead number trunk while in use will receive a busy test. We will suppose then there are 20 lines all connected to the dead number strip. Then each B. C. O. coil of each line switch will supply negative battery to the common private when grounded. This means that there will be about 3/100 of an ampere from each B. C. O. coil, or 6/10 of an ampere from the 20 B. C. O. coils. This means an excessive current flow over the private circuit of the calling connector which might damage the contacts. A better plan is to supply a common coil, say 1000 ohms to each group of lines, to supply negative battery to the common dead number private. In this case the private from the line switch is unsoldered, and the private from the connector bank is soldered to the common dead number private. Then the maximum current flow to any connector calling this trunk will be only that supplied by the 1000 ohm coil.

Trunk Terminals.

The arrangement of the trunk terminals shown in Fig. 284 are more fully shown in Fig. 285. The upper portion of the drawing shows the arrangement for 10% trunking, or where one master switch controls the 100 lines. There would be one group of 10 connectors wired to 10 sets of trunk terminals. In Fig. 285 only two sets of trunks are shown. There are 4 wires for each trunk, the negative and positive line, the hold and release trunks. The trunk cables to the connectors then are wired to the top set of terminals on the left. Section "A" of the trunks from the line switch banks is wired to section "A" terminals, also the same applies to sections "B"-"C"-"D." The bottom left row of terminals of the upper part of Fig. 285 are shown wired to the bottom row of terminals on the right hand side. The terminals are soldered together as shown by the lines connecting them in the drawing. This means that a call from section "C" would go down from the second row of terminals on the right across the jumper cable and up and out to the connector through the trunk cable. It is possible by this method to open up any set of terminals. Therefore if a trunk wire is grounded in a 100 line group it means that there are any one of 100 places where the trouble might be. Therefore the first thing to do would be to unsolder the terminals and find what group the trouble is in. This cuts the trouble down to a possible 25 places in as many line switch banks. The wiring of the line switch banks being in loose cable form, each wire can be spread out separate from the others. Here is a place where the use of the tone and the hooked type exploring coil



(*Continued on page* 45.)

Fundamental Conception of Carrier Currents

What Constitutes a Carrier Current?—Application of Carrier Currents.—Beginning of a New Series of Articles by Mr. F. J. Dommerque, Fellow A. I. E. E.—These Articles Should Be Filed.

What Constitutes a Carrier Current

A carrier current is an alternating current of high frequency. We know that every alternating current has a frequency which is expressed in periods or cycles per second. A high frequency means that the frequency reaches a high number; how high has not been exactly fixed nor is there a sharp division line between low and high frequencies. In power work we speak of 25 cycle- or 50 cycle- or 60 cycle-current; these cycles designate a low frequency. Telephone currents have a frequency ranging from 200 to 3,000 or more cycles. The current form varies greatly. Each letter in the alphabet has a different current form, which is more or less complicated; but these forms have as fundamental the sinewave. The composition of the voice currents does not concern us so much at this juncture as the frequency.

Each sound wave has a different frequency, but all of them are located in the frequency band from 200 to upward of 5,000. The frequency band containing the most important frequencies for the transmission of speech may be assumed to reach from 300 to 2,200 cycles. The frequencies in this band are considered as low frequencies, but may be designated as "audio" frequencies in distinction from "carrier" frequencies, which lie above the voice or audio frequencies, and from "radio" frequencies which are the highest, say from 100,000 cycles per second upward.

In order to avoid any distortion in, or curtailment of, the quality of speed transmission it is safest not to go below 5,700 cycles per second with carrier frequencies. As a practical arrangement of frequencies for carrier currents it has been proposed to select as carrier frequencies suitable for telephone transmission the frequencies from 10,000 cycles per second upward, leaving the frequencies between the audio frequencies and 10,000 for carrier current telegraphy.

Application of Carrier Currents

Long before 1900, attempts had been made to send several messages over one and the same circuit. The end in view was, of course, to find a practical method first of multiplex telegraphy and afterward of multiplex telephony. It would lead too far to give an account of these attempts at multiplexing, only the most characteristic ones may be mentioned. Shortly after 1890 the French scientist Mercadier brought out a scheme of multiplex telegraphy by means of high frequency currents and tuned telephones. He employed a number of vibrating reeds for sending, and an equal number of corresponding reeds for receiving. The sending reeds produced carrier frequency waves, which, when arriving at the receiving station, set into oscillation the receiving reeds which were tuned to correspond to the vibrations originated at the sending station. The oscillations of the receiving reeds again gave out audible notes or sounds.

In the files of the American patent office a number of patents may be found which indicate that inventors tried to develop multiplex telephone systems on the same principle. But in order to obtain practical results it was necessary for the high frequency currents produced at the sending end to be inaudible at the receiving end. Now it is a well-known fact that currents to be inaudible in a telephone must have a frequency of at least 15,000 cycles per second. With the means at disposal in those days it was impossible to produce the required high frequencies, only after radio telegraphy had been developed, such high frequencies could be produced by the aid of the electric arc or by so-called high frequency generators. To General Squier belongs the credit of having first demonstrated the transmission of speech by means of high frequency currents obtained from a generator over a short cable, after the German physicist Ruhmer had shown by means of high frequency currents produced by oscillating arcs, that not only could speech be transmitted but also that several messages could be sent over the same circuit by using a different wavelength and a corresponding tuned receiver for each message.

Neither the electric arc nor the high frequency generator as it was at that time provided a reliable and stable source of continuous oscillations such as were of necessity for a satisfactory operation of multiplex telephony; it remained for the appearance of the electron tube to give the entire field of transmission with and without wires a new impetus in the application of carrier currents.

The "Movement of Electricity Through Gases and the Electron Emission" have been discussed in a chapter from "Modern Physics" in the TELEPHONE ENGINEER of July, 1928, and the "Vacuum or Electron Tube as an Oscillator" in the TELEPHONE ENGINEER of August, 1928, hence they do not require any further elucidation. The same paper contains also an account of the "Vacuum Tube as an Amplifier, Modulator and De-Modulator," all properties of the electron tube which find application in carrier current technique as will be seen from future discussions.

The development of the vacuum tube was followed by the development of the electrical or wave fitter, another piece of apparatus essential to the success of multiplex operation of carrier systems.

A multiplex system in order to be commercial must be economical, which means the equipment and operation including maintenance of the channels constituting the system must not exceed the cost of the wire circuits which would be required otherwise.

The expansion of the toll and long distance net over the entire country at the present date gives ample opportunity for the employment of multiplex telegraphy and telephony by means of carrier currents. The tendency to be followed in this expansion is the following: Whenever an existing telephone circuit is loaded to its capacity an investigation must be made whether it is less costly to multiplex the circuit or add more circuits. As a rule it will be found that multiplexing will prove profitable up to a certain distance, after that cabling the long distance lines will be advisable.

Explanations

Frequently in discussing high frequency phenomena the designations "wave" and "oscillation" are used promiscuously. In physics a clear distinction is made between the two. An electric or electromagnetic wave, which is usually meant when speaking of waves in connection with transmission problems, simultaneously electrifies and magnetizes the space everywhere in its reach, thus producing an electromagnetic field, the direction of which changes periodically. This field "propagates" with the velocity of light. Hence when speaking of waves we ordinarily mean electromagnetic waves "propagating" either through space in all

directions or along wires, the wires serving in that case only as a means to guide the waves in one particular direction. There are also in existence "stationary" waves. Such a wave is obtained when an electromagnetic wave is reflected by a metallic surface so that the reflected wave and the original wave are superimposed and form a "stationary" wave; but, in general, waves are formed by propagated alternations of the electromagnetic field.

"Oscillations," on the other hand, differ from the above described waves in that they are always "stationary." They form an alternating electric field at one place, mostly between the coatings of a condenser, and an alternating magnetic field at another place, mostly in the space embracing an inductance coil. When the oscillations take place, the one of the two fields obtains its maximum value when the other field passes through its

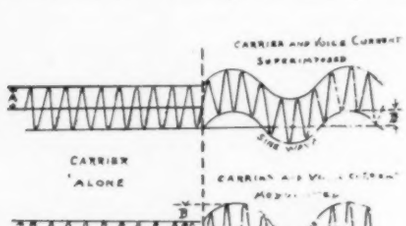


Fig. 1—Superposition and modulation

zero value. The oscillation circuit also has been explained in the paper on the vacuum tube mentioned before.

Many (including the writer) sometimes have been lax in their description of the modulation process, saying that in modulation carrier currents are superimposed by voice currents. There is a great difference between "superposition" and "Modulation." Modulation is the process of "melting together" the carrier and voice currents, while superposition is a process of "placing" the one over the other. This difference will appear better from the illustration in Fig. 1, where in the upper part the carrier current is first shown by itself, and then with the voice current "superimposed." Instead of the voice current, as it exists in reality, we have for simplicity's sake shown the fundamental wave only; that is, the sine wave without any harmonics. In the lower part of Fig. 1 the carrier current and the voice current, respectively, its fundamental, are presented in their "modulation" process. The modulation of a more complex form of voice current has been illustrated on page 9 of the August, 1928, number of the TELEPHONE ENGINEER.

An example of superposition of direct and alternating current is furnished by simultaneous telegraphy and telephony over the same wire or circuit.

The Components of the Modulated Wave

The modulated wave in Fig. 1 is composed of the carrier wave and the voice current wave. The carrier wave has the amplitude "A." The voice current wave, for which the sine curve in Fig. 1 is taken as a representative, may have the amplitude "B." Then by the definition of sine waves the carrier wave can be expressed as A sin $\omega_1 t$ and the voice-current wave as B sin $\omega_2 t$, where $\omega_1 = 2\pi f_1$ and $\omega_2 = 2\pi f_2$ designate the periodic value of time or the angular velocity of the carrier and voice current wave respectively. The modulated current wave can then be expressed as:

$$I = (A + B\sin\omega_2 t)\sin\omega_1 t$$
$$= A\sin\omega_1 t + B\sin\omega_1 t\sin\omega_2 t$$

By trigonometrical transformation this expression becomes:

$$I = A\sin\omega_1 t + \tfrac{1}{2}B\cos(\omega_1 - \omega_2)t - \tfrac{1}{2}B\cos(\omega_1 + \omega_2)t.$$

Thus the modulated wave can be analyzed into three pure alternating current components, with the angular velocities $\omega_1+\omega_2$, ω_1 and $\omega_1-\omega_2$, one of which, namely A sin $\omega_1 t$, is the carrier wave. As the amplitude B and the angular velocity ω_2 does not appear in this carrier wave, it is left to the two other waves, one of which, namely $\omega_1+\omega_2$, is greater in frequency than the carrier wave by the frequency of the voice component, and the other, namely $\omega_1-\omega_2$, of which is less by the same amount, to

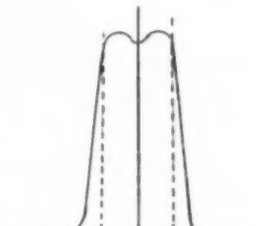


Fig. 2—Flat-topped resonance curve

transmit the characteristics of the voice current wave to the distant end of the line.

In order to receive the characteristics of the modulated wave without distortion the receiver must be tuned for a frequency band having a width of at least twice 2,000 cycles. The sharp-pointed resonance curve as is in use for tuning for one particular frequency will not answer this purpose, because if the receiving circuit would be timed for one of the frequencies, the others would be unfavorably affected, therefore the resonance curve must be flat-topped as shown in Fig. 2.

Of the two halves of this frequency band the one-half extends from the carrier frequency plus 200 upward to the carrier frequency + 2,000 and the other half from the carrier frequency minus 200 down the carrier frequency—2,000. These two halves are designated as the "upper side band" and the "lower side band" respectively. It is, however, not necessary to transmit both side bands to the receiving end. As one side band contains all the elements required to reproduce speech, one side band is sufficient; consequently only half the frequency is required. The effect this has on the wave form is also shown in the carrier modulation diagram on page 29 of the August, 1928, TELEPHONE ENGINEER.

Arrangement of Carrier Channel

The carrier circuits terminate at the toll office, where the connections are

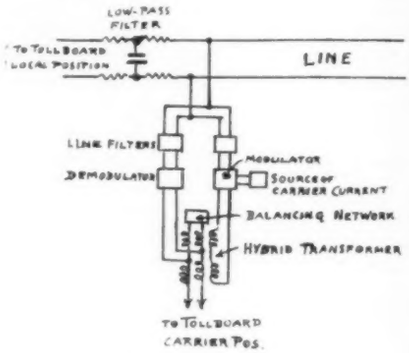


Fig. 3—Two-way carrier terminal

made to the ordinary telephone or low frequency channels and to the various high frequency or carrier channels. No high frequency energies must have access to the low frequency channels at the terminals, else there would be caused disturbances and energy losses. Therefore filters are inserted in the ordinary telephone line before connection to the carrier channel is made in order to keep the high frequencies out; these filters are low pass filters.

Filters are also inserted in the carrier channel before the modulated current enters the line and after the demodulated current passes on to the tollboard. These filters are entered as line filters in Fig. 3. In the same figure is indicated the source of carrier current and an alternating current bridge consisting of a differentially wound transformer which connects on the one hand the low frequency line to sending and receiving branches of the two-way transmission circuit, and on the other hand to a balancing net work. The balancing net work is an artificial line, made up of resistances and capacities; such net works have been described on pages 17 and 18 of the June, 1928, number of the TELEPHONE ENGINEER.

The windings of the transformer in the bridge are so arranged that the voice currents flow through the two halves of the primary winding in equal amounts but in opposite direction. If the impedance of the balacing net work exactly

(*Continued on page* 28.)

LINE AND DESK

PARTY LINES AND GOOD SERVICE

In a recent number of Bell Laboratories Record, Bancroft Gherardi, vice president of the American Telephone and Telegraph Co., is quoted as saying that the multi-party line must not be regarded as the limit in good telephone service. According to the record, Mr. Gherardi said: "That telephone service may be both dependable and satisfactory, it is not sufficient alone that the plant be adequate, but particular attention must be given to every phase of service rendered. In considering service it is essential to think of it from the standpoint of all departments and not simply in its narrower sense relating to the completion of telephone connections. Also the type of service taken by our subscribers should be consistent with the overall problem. For example, the highest grade of service is not compatible with too many multi-party lines and the best efforts of the Bell System will fall short of the desired objectives if our subscribers are not induced to take the highest grade of service consistent with their requirements."

DID YOU MISS THEM?

For the first time in over seven years two familiar figures were missing from the pages of TELEPHONE ENGINEER in our January number. We are wondering if you missed them? We refer to the lineman on the pole in the upper left hand corner and the test deskman in the upper right hand corner of the Line and Desk page. While their absence in January was unavoidable, their reappearance this month gives assurance that they will be with us in the future as in the past. We are sure they will be welcomed by their many friends who earn bread and butter and contribute to the making of a going telephone business by their work on the telephone lines and at the many test desks of the telephone systems of the country.

While we are on the subject, we may say something about the job of conducting this department. Altogether it has been a most pleasant job to receive and publish the many contributions from the practical men of the field. The department is designed to be a clearing house of practical hints for and by the men who have the job of doing rather than supervising the work in the telephone plant. To all of the men who have contributed in the past we extend our thanks and those of many readers.

We might also say a word to others who might become contributors. If you have an idea or some experience that you think would interest or help some other worker in the field, send it along. Do not worry about trying to do fine writing. Tell us the story in your own words and we will do the rest. If it needs a sketch, draw it out in pencil and we will get it into shape for publication.

We will let you in on a little secret. We have an arrangement with the business office that they are to send out a little check to our contributors whose contributions appear in this department. So let your contributions come. You will have the pleasure of helping others and the little check you receive may come in handy to buy Johnny a new baseball bat or Jenny a new doll when the kids' birthdays roll around.

AN IDEA THAT IS TOO NEW

In December Line and Desk we put out a call for help for one of our readers who asked for information regarding the universal use of coin collectors or measured service in a small city exchange. An unusual thing occurred. We did not have a single contributor come to bat with a suggestion. We guess that the idea is so revolutionary that no one really has had a chance to figure it out. However, our next guess is that it started some of our helpers to thinking and we may hear from them yet. The subject is still open. If you have any ideas about it, let them come.

BRICK PHONE PLANT MOVED WITHOUT SLIP

Dallas, Texas.—Setting what is believed to be a record in the speed for moving such a building, the No. 2 exchange of the Southwestern Bell Telephone Company had been moved its complete 18 feet at noon, just twelve hours after the moving began, and stood above its new foundation where it is expected to rest for another thirty years.

The building had four inches to go at slightly before 12 o'clock, and was moving onward with the steadfastness and about the same speed, as the sands in an hour glass. Regularly the whistle of the foreman blew, regularly the turns of the jacks forced back the four-story building.

The difficult moving of the telephone exchange while maintaining full service was accomplished in just half the time that was expected, telephone officials pointed out Thursday.

This was made possible by the fact that connections were maintained through the adjustment of flexible wires and pipe connections at about as fast a rate as the movers could safely turn their jacks, it was said. The adjustment of connections was expected to slow up the business. Instead, an almost steady pace was maintained. The building was moved back from Akard street in about twelve working hours. No work was done during the night.

Not for a moment did the service stop, according to Ray Jackson, traffic manager and supervisor of the "Hello-girls" who got the "ride." The important "2" exchange continued full force, with not a single case of "sickness," he said. Jackson, who is one of the principal Oak Cliff Little Theatre actors, used his "stage" personality to the greatest advantage in cheering on here and bolstering failing courage there.

One telephone girl fainted, but was restored by use of smelling salts, and continued on the job. For two weeks beforehand, the moving of the building was the foremost subject on the operators' minds, Jackson said. All speculated on "what would happen should anything go wrong." New York engineers of the company assured officials here it could not be done, it was said.

Moving of a machine exchange had never been attempted before. Moving of such a large building with full equipment going had never been attempted.

"The machine equipment, if it got out of place by as much as a quarter of an inch, would have grave results in the matter of service." Frank Shoup, director of publicity for the telephone company, said, "Not one call went amiss, however. Smaller manual exchanges had been moved before. But never a job like this."

The jacks will not be removed, and the building allowed to settle on the new foundation, after which the widening of Akard street may proceed. The work cost $75,000.—*Dallas Times-Herald.*

Big Traffic Needs Su

Efficient railroad and steamship facilities embodying those conveniences desired by the traveling public have produced the heavy traffic of today.

The same condition prevails in the telephone field. The Stromberg-Carlson Super-Service Switchboard, with its many features for furnishing efficient service, has greatly increased telephone traffic.

The Stromberg-Carlson Super-Service Switchboard has been made as nearly mechanically perfect as possible so that the operator's duties are simple, fool-proof and easily performed. Operators can handle big loads with the speed and accuracy which the urgency of modern business and social life demands.

One outstanding feature of the Stromberg-Carlson Super-Service Switchboard that permits the big traffic loads to be handled easily is the simplified keyboard. There is a single key for each ringing frequency which is selected accurately by touch. No time or effort is consumed in associating the correct cord and key, consequently, operators work with great efficiency even under the pressure of heavy traffic.

Let Stromberg-Carlson engineers explain fully why the Stromberg-Carlson Super-Service Switchboard is the most efficient and economical telephone switching equipment.

Write for booklet illustrating typical Stromberg-Carlson Installations.

Pacific Coast Representative
Garnett, Young & Co.,
San Francisco, Cal.
Los Angeles, Cal.
Portland, Ore.
Seattle, Wash.

Stromberg-Carlson Telephone Mfg. Co.

Factory and General Offices:
117 CARLSON ROAD, ROCHESTER, N. Y., U.S.A.

Branch Offices:
KANSAS CITY, MISSOURI CHICAGO, ILLINOIS TORONTO, CANADA

Southern Representative
Scoville Mercantile Company,
Atlanta, Ga.

Stromberg-

...d Super Equipment

Features of the Stromberg-Carlson Super-Service Switchboard:

...tantaneous Ringing Start
...rator's Secret Service
...ual Ringing Indication
...ance Plugging-In
...erting Call Ringing
...ible Busy Test
...tive Supervision
...-Ring Signaling
...rgency Ringing
...hine Ringing
... Registration
...rator's Bar
Operator's Cut-In
Dark Keyboard
Flash Recall
Ringing Tone
Operator's Listening Indication
Instantaneous Ringing Cut-Off
Reverting Busy Test with Tone
Operator's Ringing Control
Calling Subscriber's Ringing Control

...g- Carlson

Ramblings

By J. A. S.

The very interesting news comes from Sherman, Texas, that Northern Texas Telephone Company is to spend a quarter million dollars for improvements. Among other things a new exchange building will be erected in that city. This is the home of C. A. Shock, who has grown with the exchange until they are both large enough to be reckoned with when telephone matters are to be discussed. Shock is a former Ohioan, but took the advice of Horace Greeley, and has been glad of it ever since.

* * *

In the ever-changing conditions in the telephone field, an old timer in Texas passed from the picture recently as far as operating manager was concerned. J. C. Roberts, former manager of the Goldthwaite Rural Telephone Company, disposed of his holding and joined the "back to the farm" movement. Roberts was not a heavy holder of properties but he usually showed up at the Texas convention with his "widow's mite" to help run the affairs of that association.

* * *

During a recent visit over the country, Ramblings editor spent a few hours in the office of A. B. Chance over at Centralia, Mo. We always look forward to these visits, and because of old friendship we usually forget business, and review past incidents in telephone history. The recent passing of John F. Tompkins was mentioned by Mr. Chance as one of the outstanding sales managers of his time; then there was F. A. Rader, at one time covering territory for Cook Electric Company; and others on down the line. Mr. Chance has built up a wonderful business since our first visit with him.

* * *

And on up the line we met M. J. Bell of the Bell Lumber & Pole Company of Minneapolis, and L. L. Hill of the Page & Hill Company, Minneapolis. These two pioneers in the cedar pole business have been numbered among our friends for the past twenty years, and are both enjoying health and prosperity. On our first visit to Minneapolis—we lived in Texas then—these gentlemen took a great deal of pleasure in showing us the many places of interest in their city; and it was midwinter and they ran about like school boys without overcoats, while we shivered with all the apparel we could carry. I have never been sure but what they were "kidding" me. But the twenty years are telling on them, and they now get inside of all the wrappings they can when called out.

* * *

The Associated Telephone Utilities Company of Chicago recently annexed two of the best Independent companies in Pennsylvania. The Erie Mutual Telephone Company of Erie, and the Johnstown Telephone Company of Johnstown, were the companies transferred. About 40,000 telephones are controlled by these properties.

* * *

Down in Texas that very progressive organization known as the Texas Independent Telephone Association is planning for its silver anniversary convention during March—if the snow melts by that time. For the second time during the life of this writer Texas experienced zero weather; that is the eastern half of the state. Of course Amarillo in winter is a door neighbor to Alaska. Fort Worth, convention city for the Texas aggregation, has a lake one mile wide and twenty miles in length. Ice formed on this lake seven inches thick and permitted ice skating—some novelty for Texas people. 'Twas remarked by one Amarilloite while visiting in Alaska, that upon peeping from under his blankets one morning and finding the register around forty below, he certainly would hate to be in Amarillo on that day.

* * *

Telephone Engineer received notice during the latter part of December that the Athens Home Telephone Company, Athens, Ohio, was mailing out its 90th consecutive dividend. Checks are mailed quarterly to the 175 stockholders of this progressive telephone utility. Some record, we'll say. But it is no more than would be expected from an executive like Dr. C. L. Jones. Athens is indeed fortunate to have for head of its telephone exchange the type of men who direct the destinies of its most important utility.

* * *

H. L. Harris, executive vice-president of the Associated Telephone & Telegraph Company of Chicago, is spending several months in Europe in the interest of his firm. He left New York the latter part of December.

* * *

A. R. MacKinnon, brother to F. B. MacKinnon, president of the United States Independent Telephone Association, was recently appointed secretary of the Kansas Telephone Association with headquarters at Topeka, which insures that the important work of the Kansas Association remains in good hands.

* * *

February 1 we received a New Year's greeting card from Rajkot (India). The country did not stand out like the greetings and for a moment we wondered if some other race were vying with our Yiddish friends to further remove Christmas and New Year's—a custom long established and which might be hard to conform to by some of our pre-Volstead lovers of the egg and nog combined. The custom, more or less ancient, where a fellow passed out on Christmas and revived the day following New Year's, is still popular with those who loved to spend an entire week "back home," usually at the expense of the firm, and we should veto such a move if it were proposed. But on second notice we recognized that it was a country far removed from this and, while the intentions of the sender were doubtless sincere, it took it a whole month to reach us.

* * *

By the way, who started this New Year's greetings, anyway? Of course it sounds good, but it has long been our idea it was to bolster up the feelings of a fellow just before the Christmas bills arrived. A fellow recently reprieved from hanging lamented the fact that he would be deprived of the fried chicken dinner served the evening prior to the execution. The greeting probably was intended to take the place of the chicken dinner.

* * *

Our friend, W. L. Prehn, manager of the Southwestern Bell Telephone Company down at Dallas, Texas, recently stated that in reading "Ramblings" he could visualize a homesick boy wondering when the sentence would be commuted and he could return home to the old stamping ground. We have tried to hide this feeling, and maybe it does crop out, but we are not ashamed of it. While the middle west and effete east hold many beauty spots, and—shall we say it—the people exude more energy and progressiveness, maybe, there "ain't 'nary a fly" on the old red hills of east Texas nor the black waxy farms further west.

* * *

The above paragraph was written because our mind did wander down south during the zero days of January. But a letter from our old friend, C. A. Shock, of the Northern Texas Telephone Company at Sherman, reminded us (although he did not mention it) of our former residence in his home city. It was away back when—. Sherman, as we recall, was the first city in Texas to boast of a hosiery mill—and they were proud of it. They boasted, too, of the first mill that made guaranteed, dyed-in-the-wool holeproof—and every other proof hosiery. If you were not satisfied, take them back and get your money! you did not have to offer any excuse. One of the big firms of Sherman—Bray Brothers (no insinuation) handled these hose. One day a tall colored woman waddled into this great store and demanded her money back on a pair of these celebrated hose. The money was forthcoming, and the clerk casually asked "if the hose did not come up to expectation." "Nossir," replied this sister of ancient Ham, "they did not even come to my knees."

Annual Meeting of American Electric Co.; Officers Elected

At the annual meeting of the board of directors of American Electric Co. Inc., which was held in Chicago, Saturday, January 25, the following officers were elected: H. L. Harris, president; W. F. Benoist, first vice-president; J. E. Fisher, vice-president and general manager; W. E. A. Nottorf, vice-president; G. L. Grawols, treasurer, and R. J. Munro, secretary.

H. L. Harris continues as president of the American Electric Co., Inc., having been re-elected at the annual meeting

The report made by Mr. Fisher indicated that the affairs of the company are in excellent condition, the amount of business handled during the past 12 months having been substantially in excess of that of preceding years, while the prospects for 1930 seem by every present indication to promise a continuance of this healthy condition.

J. E. Fisher was re-elected vice-president and General manager of American Electric Co., Inc., Chicago

The board of directors also approved the appointment of R. W. Siemund as general sales manager. Practically the entire career of Mr. Siemund has been in association with the manufacturing and supply end of the telephone business. For the past three years he has had charge of the supply sales department of American Electric Co. Inc., and previous to that, of similar work for the Monarch Telephone Mfg. Co.

R. W. Siemund, formerly in charge of supply sales of American Electric Co., Inc., was appointed general sales manager

In the short space of a few years he has been largely instrumental in building up this branch of the company, which is recognized as one of the most important sources of supplies to the Independent telephone trade. Much of this has been accomplished through his efforts in improving shipping schedules, in judicious buying and the careful selection of products and by economic arrangements with manufacturers.

The coordination of the entire sales activities of the company under Mr. Siemund's guidance holds out every promise of being a most wise and logical step.

The newly-elected members of the board of directors are H. L. Harris, W. F. Benoist, W. I. Patton, H. W. Potter, J. E. Fisher, G. L. Grawols and W. E. A. Nottorf.

H. H. Ide will continue as chief engineer with supervision over all technical developments and equipment engineering.

Minnesota Holds Its Usual Good Convention

The 21st annual convention of the Minnesota Telephone Association, which convened at Minneapolis January 28th, was up to its usual standard of the enthusiastic gatherings. This state always furnishes a convention that is representative of the industry and enthuses one, if he is fortunate in being present.

The resolution was unanimously passed looking with disfavor upon any extension of federal regulation of telephone rates or service. Minnesota believes that these questions can be handled more properly by individual states.

The Association also deplored the recent statements in Minnesota newspapers criticizing statements made prior to public hearings on questions coming before the commission. Recently Minnesota newspapers had given considerable space to controversies as to earnings of certain telephone companies operating in that state.

The president's address covered many points of interest to conditions in Minnesota which were of more or less interest to other states.

Over 400 registered at the convention desk during the convention and the annual banquet, which is the social event of the convention, witnessed more than 500 members and guests. The following composed the board of directors after the election:

H. F. Lueders, manager, Carver County Telephone Co., Norwood; P. M. Ferguson, manager, Citizens' Telephone Co., Mankato; W. S. Robertson, manager, Argyle Telephone Co., Argyle; E. L. Wright, secretary, Alexandria Telephone Co., Alexandria; A. H. Dreyer, manager, Starbuck Telephone Co., Starbuck; Irving Todd, secretary, Hastings Telephone Co., Hastings; Hans Swanson, proprietor, Warren Telephone Co., Warren; S. A. Rask, president, Inter-County Telephone Co., Blooming Prairie; Jay Greaves, president, McLeod Co. Telephone Co., Glencoe, and G. M. Dwelle, secretary, Dwelle Telephone Co., Lake City.

Before its final adjournment the association introduced and passed the following resolution:

"Whereas, a committee of the United States Senate is now considering the advisability of providing by law a separate commission to regulate and have jurisdiction of the telephone business and telephone companies; and

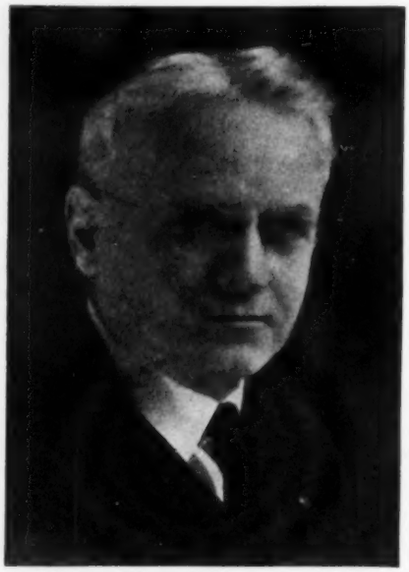
"Whereas, Federal regulation will be exclusive and supersede state regulation as has developed in the railway business, and

"Whereas, no Federal commission can possibly be as familiar with or as capable of regulating telephone exchange

(*Continued on page* 28.)

Annual Meeting of Automatic Electric Inc.; Officers Reelected

The annual meeting of Automatic Electric Inc. was held at the offices of the company in Chicago, on Saturday, January 25, and the following were elected as directors for the ensuing



T. G. Martin is now vice-president of Automatic Electric Inc., and chief engineer in direct charge of development and research

year: W. F. Benoist, Grant Pelton, T. C. Thompson, W. I. Patton, H. W. Potter, Joseph Harris and W. H. Loomis, Jr.

In his annual report, President W. F.

President W. F. Bencist of Automatic Electric Inc., reported that the plant has operated at practically full capacity for virtually the entire year

Benoist pointed out that the volume of business for the past year had been very satisfactory, the plant having carried along at full capacity for virtually the entire year. There is every indication, he said, that 1930 would prove to be as satisfactory.

At the directors' meeting, all of the existing officers were re-elected, including W. F. Benoist, president; Grant Pelton, vice-president, with supervision over manufacturing, development and research and patent affairs; T. C. Thompson, vice-president, having supervision over sales, equipment engineering and installation; W. I. Patton, secretary and general auditor; and J. P. Hauck, treasurer.

In addition, the company's chief engineer, T. G. Martin, was appointed vice-president and chief engineer, in direct charge of development and research. This appointment comes as a fitting recognition of Mr. Martin's long and valuable service, especially in connection with the technical interests of the company.

Mr. Martin became associated with the company's engineering staff in 1892, and has witnessed the growth of the Strowger Automatic telephone from crude and doubtful beginnings to an affair of worldwide commercial importance. Many of the technical improvements that have been responsible for this great commercial development are the results of his own personal efforts and most of them have been perfected under its own guidance, Mr. Martin having had supervision over technical development for many years and having been chief engineer since 1922.

O. V. Dodge, as general sales manager of the company, will retain supervision over all sales activities, while L. A. de Berard will continue as assistant general sales manager.

Minnesota Holds Its Usual Good Convention

(*Continued from page 27.*)

rates and service as will a state commission; therefore be it

"Resolved, that this association express its opposition to any extension of Federal regulation of telephone rates or service as being a matter to be more properly handled by the various states.

"Further, that the secretary be directed to forward a copy hereof to each of the Representatives and Senators in Congress from Minnesota."

"Whereas, the Minnesota Telephone Association believes that state regulation of telephone rates and service is for the best interest of the state, the telephone user and the telephone companies; but that such regulation can remain effective only so long as it is administered fairly and impartially; and

"Whereas, from the experience of its member companies, it believes that generally telephone rates in Minnesota are not excessive or unreasonable, and that statements appearing in the press that telephone rates in the state are excessive and unreasonable, in advance of any hearings or findings thereon, tend to destroy the good will and confidence now existing between telephone comuanies and their patrons; therefore be it

"Resolved, by the Minnesota Telephone Association in convention assembled, that it deplores the recent statements appearing in the press that telephone rates in Minnesota are excessive prior to any public hearings, and prior to any consideration by the Commission as to the accuracy or fairness of the figures and conclusions given such publicity."

Cedarmen in Annual Convention

The annual convention of the Northern White Cedar Association was held in Minneapolis January 14th and 15th, 1930.

Routine business was transacted; reports showed that there was a restricted amount of white cedar left in the forests, but that the very highest type of poles were available, both in the yards and in the forests. Northern white cedar poles can be secured to meet any specifications, reports showed.

The annual banquet and entertainment were features of the evening of January 14th, with a dance following the unusual program.

The following officers were elected for the coming year: President, L. A. Furlong, National Lumber & Treating company, Minneapolis; vice-president, M. E. Brown, Republic Cedar Co., Marinette, Wis.; treasurer, H. F. Partridge, T. M. Partridge Lumber Company, Minneapolis (re-elected); secretary, Norman E. Boucher, Minneapolis.

The following compose the new board of directors: Don C. Bell, Minneapolis; G. H. Ramsey, Minneapolis; J. E. Gerich, Milwaukee; L. A. Page, Minneapolis.

Fundamental Conception of Carrier Currents

(*Continued from page 22.*)

simulates the impedance of the voice frequency line the e. m. f. in the windings of the primary will not cause any current to flow in the secondary, hence there cannot be set up any "singing" in the carrier circuit. If, however, the impedance of the voice frequency line is not exactly balanced, singing may occur. This may be prevented by inserting another bridge of which the carrier frequency line forms one arm and the balancing net work simulating the carrier line impedance the other arm.

A telephone transformer of the above description with three windings so arranged that an e. m. f. in the sending or receiving branch of the bridge produces no current in the other branch, is usually called a "hybrid" transformer and the two branches are said to be "conjugate" to each other.

Underground Cable Construction

Underground Cables in Comparison to Aerial Cables Is Discussed Fully in the Following Dissertation. Actual Facts Are Cited, and Reasons Given. Written by Ray Blain

There was a time in the history of the telephone that open wire leads were adequate for all requirements. Time has, however, brought about many changes and with the tremendous increase in volume of traffic the required number of conversation channels makes open wire leads in many cases impossible and in others not economical.

This condition first existed in congested exchange areas and later with the reduced toll rates and with a corresponding increase in volume of traffic it was found in many cases that heavy open wire leads between toll centers were not economical where cable could be used. With the recent improvements in cable design and auxilliary equipment which makes long toll circuits through cable possible hundreds of miles of aerial toll cable has been placed in service.

The installation cost of cable as compared to open wire is not so much to be considered as is the tremendous difference in maintenance cost. This is especially true through certain storm areas where sleet plays havoc with open wire each winter.

It is quite true that we will perhaps have for many years to come large amounts of aerial cable in service through

Fig. 1—Aerial cable likely for change to underground

certain localities but the demand of the public and in most cases the best interests of the telephone companies themselves will require the replacement of large amounts of aerial cable and open wire by underground cable yearly.

Conditions that are in many cases forcing telephone companies to the use of underground are indicated in Fig. 1. Here as in many similar cases telephone cables are on the same poles with power wires, trolley feeders, fire alarm circuits and traffic light cables. Proper clearance is impossible, transformers are mounted near the cables and trolley wires are too close for safety.

In congested areas of cities aerial cable does not prove economical. It would not be good practice to string three 600 pair aerial when one 1800 pair cable underground would supply the same capacity cheaper and better.

The depreciation of underground cable

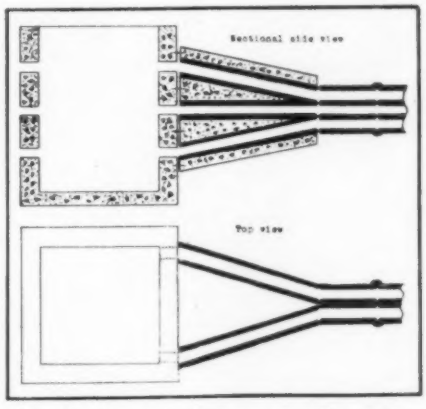


Fig. 2—New manhole construction showing "Y" arrangements of ducts.

is much less than aerial under all conditions and there is no doubt but that for this reason alone if for no other, more and more, cable will be placed underground as time goes on.

At first glance it appears impossible to prove-in an underground conduit and cable for long rural or toll service, but there are many factors to be considered. While it is true that very little if any trouble can be expected from sleet on a well constructed aerial toll cable it is also true that it is subjected to a great many mechanical troubles which underground is not. Most toll cables cut directly across country and for a great part of their distance run through fields and woods. Squirrels for some reason enjoy running along the cable span. Farmer boys always have, and perhaps always will, shoot squirrels. The same boy is not always a perfect shot and in many cases when shooting at the squirrel will hit the cable which results in a serious case of trouble. This and various other troubles usually convince the engineer that underground is always to be preferred even on long toll cables.

Type of Underground.

There are in general use three types of underground cable construction methods to be considered and the type selected will in most cases depend upon local conditions. These types are ordinary buried cable, armored cable and cable pulled in conduit with properly spaced manholes.

Many will not consider favorably the buried type cable where the lead sheath is placed in direct contact with the soil without some mechanical protection. While I would not generally recommend this type construction in this day and age I have known of numerous cases where it has given entire satisfaction. Before lead cable is placed in the ground, unless the soil conditions are known, it is always best to have samples of it analyzed to make sure that it does not contain certain chemicals which when brought in contact with the lead will set up a local action that will in time ruin the cable. I know of a case where ordinary iron water pipes were placed in cinders under concrete floors in a large warehouse. After being in service for a number of years a large leakage was noticed and upon examination it was found that the entire pipe system had been ruined by electrolysis, or as generally referred to, corrosion.

While armored type cable would not ordinarily be advisable for exchange use it is believed to be ideal for certain long toll or rural leads. This type cable consists of the ordinary lead sheath provided with impregnated paper, jute and steel tape coverings which provides adequate protection from corrosion and mechanical injury.

The best type construction is of course the conduit and manhole system even though it does cost more. At first thought such a conduit system would seem impossible for a long toll cable. I had the pleasure a short time ago of driving from St. Louis to Kansas City along the route of the new toll underground cable between these two large toll centers which is at the present time under construction from each end. I noticed that considerable different methods were being used in the placing of such a system which makes its adoption to large toll projects possible. One phase that interested me particularly was that manholes were being precast of concrete in the yards centrally located and hauled to the required location and set in the hole prepared for it in the conduit line. When I was a boy back on the farm they used to joke about buying postholes from Sears Roebuck and I doubt if this

will be impossible a few years hence.

On this particular conduit run they were using 6-duct vitrified clay conduit and when the run reached a point far enough from the manhole to give the ducts a good angle without a corner they divided and the three entered the manhole on either side equally spaced and separated as much as possible from top to bottom. This arrangement is no doubt to permit ample splicing room and perhaps for loading.

Large fan shaped blocks of concrete were precast which contained the single duct clay tile in the angle from the multiple duct to the manhole. These were also transported from the yard by truck to the point used. This type manhole construction is indicated in Fig. 2.

I believe that the day is coming in the not far distant future when some type of metal will be used for manholes which will answer the same purpose as does the concrete but will be lighter, cheaper and easier to handle in every way.

I noticed also on the St. Louis job that three sections of the multiple duct were being joined together in the yard, making fewer connections in the trench

Fig. 3—Fibre conduit staked in trench

necessary. Manholes in this lead I understand are being placed in most cases at loading points which makes a fewer number necessary. By utilizing all of these improved designs and methods together with power diggers and backfilling machines, also air hammers for cutting rock instead of blasting is making possible the use of such conduit systems over long distances. The distance between St. Louis and Kansas City I believe is approximately 270 miles. I wonder what would have happened if some engineer should have even suggested building a conduit system of this length just a few years back?

Engineering the Duct System.

Before the underground cable job in any exchange is started the entire area to be served by it should be studied thoroughly. Forecast studies of the possible telephone growth in each section to be served should be made and the plant designed accordingly. The cable capacity is not as important as the main conduit capacity for if the duct system is large enough the cable plant can be more easily changed or enlarged than can the conduit.

Enough ducts should be provided in each main run to care for the total capacity ever required with one over for repairs. I knew of a case recently in an eastern city where a section of cable in a downtown district went bad from electrolysis making its replacement necessary. There was no spare duct in the conduit run so the spare cable had to be cut in as a loop in the old cable which was then pulled out and the new pulled in and later the old defective cable cut out and salvaged. This was a difficult and expensive operation which could have been avoided had a spare duct been available. In this case there was perhaps an excuse as the conduit system was built several years ago before anyone realized that the telephone would ever have such a growth as it has seen. This age we know that the telephone plant must be designed to have at least one line possible for each residence or each room in a business building. There seems to be no excuse in ordinary cases for not designing a duct system to take care of a reasonable growth.

Lateral runs should also be provided with spare ducts where it is thought additional capacity will ever be required. I am in favor of never laying a single duct conduit as even on a lateral into a building it may be necessary to increase the size of the cable and in this day when there must be no interruptions to the service a spare duct is a great convenience even on a small lateral. While it is hardly possible to provide too many ducts there is always a danger in not having enough. This should be kept in mind by the engineer and an additional dollar spent at the time of building may mean the saving of a hundred some few years later.

The following points should always be considered thoroughly in the plans of a new underground system:

Type and size of conduit.

Kind and size of manholes.

Locations of manholes.

Type of frames and manhole covers.

Foreign obstructions to be encountered such as water pipes, etc.

Depth of ditch required to obtain proper grade.

The plans should be kept up-to-date as the job progresses so that when completed a permanent record can be made. For example a manhole of a certain size in a certain location may be specified in the plans. After excavations are made it may be found that water or sewer pipes are in such position that the shape of the manhole must be changed or perhaps moved entirely. These changes should all be noted in detail on the working drawings.

Selection of Conduit.

Four different types of conduit are ordinarily used for underground telephone work, namely vitrified clay, creosoted wood, sometimes called pump

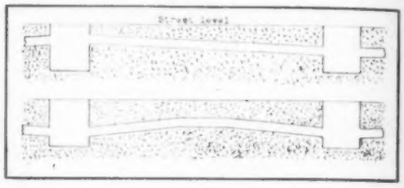


Fig. 4—Showing grade arrangement of conduit

log, fibre and wrought iron pipe. Of the four types clay is perhaps the most generally and commonly used but this does not mean that the others are without merit in their respective fields. The use of vitrified clay duct has recently been made more flexible by the introduction of the slant or mitred joint. This joint makes possible the fanning of a duct bank when crossing over viaducts, etc. It also permits the swinging of a duct line to dodge an obstruction or go around a curve without the necessity of expensive manholes. Vitrified clay usually consists of two, four, six or nine ducts and sometimes eight duct is used.

Creosoted wood conduit is generally of the single duct type and as many laid in the same ditch as ducts are required. It can be obtained in two ducts and in a few cases four duct is furnished. The single duct type is, however, the more commonly used.

Fibre conduit always comes in single duct but is quite commonly laid in a multiple arrangement as indicated in Fig. 3. As many ducts as required can be laid in this manner. If either wood or fibre conduit is laid too near the surface without any mechanical protection there is the possibility of the cable inside it being injured by the accidental entrance of the point of a pick.

Wrought iron pipe is the most expensive of any of the different types of conduit and is not generally used for main cable ducts. There are places, however, where its use is necessary regardless of cost. For example where a cable is carried over a bridge its use is necessary, as it will support itself between girders. Also it may be bent and shaped so as to miss obstructions. It is also quite useful for the protection of cable

THE TELEPHONE BRINGS THE ADVANTAGES THAT COMFORT AND CONVENIENCE GIVE TO LIVING

This is the telephone's mission

An Advertisement of the American Telephone and Telegraph Company

IN THIS COUNTRY, a new type of civilization is being reared—a civilization of better opportunity for the average man, comfort and convenience, business enterprise and higher standards that enrich the daily life of all the people.

To build for this new age, the Bell System in 1929 expended more than 550 million dollars. These millions were used to add new plant and further improve service. Hundreds of new buildings, millions of miles of wire, chiefly in cable, eight hundred thousand new telephones—these were some of the items in the year's program of construction. At the same time, better records were made for speed and accuracy in service.

This American development of instantaneous communication, of fast, far-reaching speech, belongs not to the few, but to the many.

It is the aim of the Bell System to permit each personality to express itself without regard to distance.

This is part of the telephone ideal that anyone, anywhere, shall be able to talk quickly and at reasonable cost with anyone, anywhere else. There is no standing still in the Bell System.

running into buildings underground and for risers where the underground takes aerial on a pole.

Trenching for Conduit.

When the street is paved new underground is usually placed in the parkways between the sidewalk and the curb if possible. If this parkway is in grass the sod should be carefully removed so that it can be replaced after the ditch is backfilled. If a trench is dug through private lawns it is generally a good practice to lay canvas to hold the loose dirt, thereby destroying the grass as little as possible. Sometimes it is cheaper to place the conduit run under sidewalks if the manholes can be located in streets and alleys as the covers are usually objectionable in sidewalks. When opening a trench through a paved street the surface material should be placed on one side and the dirt on the other. If not all new surface material must be obtained to refinish the street.

The trench on main conduit runs should be dug deep enough to permit a distance of not less than two feet from whatever protection is used on top of the conduit to the surface grade of the street. The width of the ditch will of course vary according to the type and size of conduit used.

Hand digging of ditches for any amount of underground cable in this machine age is out of the question for several reasons. First the hand method is expensive and slow. It is never advisable to keep a street or any part of it blockaded any longer than absolutely necessary. For the large companies with considerable underground work to do the purchase of their own digger should be considered. I consider the smaller type, commonly referred to as the "Baby Digger" ideal for general telephone work. These machines are only 58 inches wide, 19 feet long and weigh about four tons. Their small size makes them easy to handle and it is possible to dodge trees, poles, hydrants and other obstructions that it would be impossible with the old style diggers commonly used for water pipe and sewer work. For the smaller companies that cannot afford their own digger it is generally possible to rent one or contract with the owner of one to do the trenching.

Grading Duct Line.

The entire section of the ditch between two manholes must be opened before any conduit is laid. This is necessary so that any unknown obstruction which might alter the grade of the line will be discovered before a grade is decided upon. The bottom of the ditch should be thoroughly tamped and leveled to the grade desired. The concrete base or creosoted planks if either are to be used should then be placed at the proper grade. The grading of the duct line is

for Low Cost Digging

THE BABY DIGGER

THE Cleveland Baby Digger is especially designed for underground conduit trench. Many telephone companies and conduit contractors have found its ability to cut costs and speed up the work, of indispensable value.

Not only does the Baby Digger do the work at 20% of hand-labor cost, but because of its many distinctive, different and exclusive features it enables you to dig a big majority of all your jobs by machine.

Only 58" wide, and weighing but 4 tons the Baby Digger is so compact and comparatively light in weight that it operates at high efficiency in parkways, between sidewalk and curb and close to trees and poles.

Because of its extreme mobility the Baby Digger greatly cuts down non-productive time. You can load or unload it on its own Special Trailer in less than five minutes and then travel at truck speed to the next job.

Add to these features advance design, abundant power, and unsurpassed ruggedness, and you will understand why the Cleveland Baby Digger is delivering maximum performance at minimum cost.

Write today.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 St. Clair Ave. Cleveland, Ohio

AMERICAN CROSSARM & CONDUIT CO.
14 Mills Main Office—Chicago, Ill. 73 Warehouses
Manufacturers and Distributors
CROSSARMS — FIR — Creosoted — Yellow Pine
Creosoted Wood Conduit
Pin and Brackets

Super-Service on rush orders!

If you are in a hurry your order can be loaded and on the way the same day we receive it. Quality poles since 1882 assures you of guaranteed stock and satisfactory dealings. Let us quote you prices.

Northern and Western Cedar
With or without butt treatment

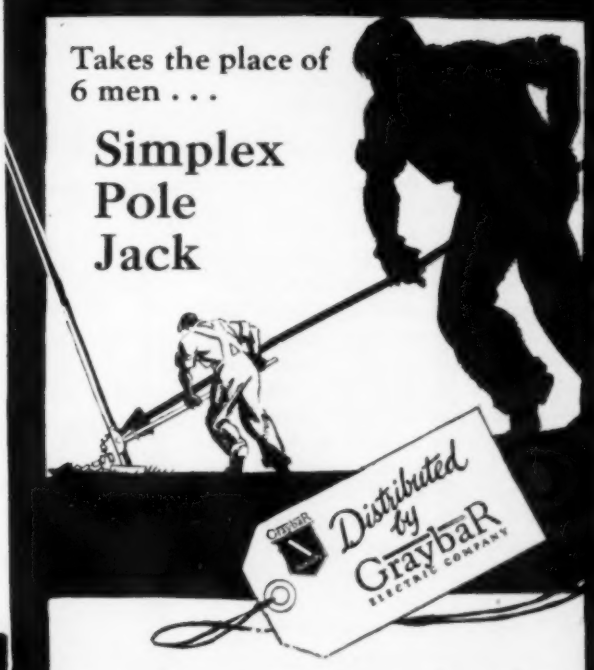
NAUGLE POLE & TIE COMPANY
59 East Madison Street, Chicago
Branches: New York, Columbus, Kansas City, Spokane, Los Angeles, Boston, Madison.
Main Yards and Butt-treatment Plants: Minneapolis, Pinconning, Michigan, Spokane, Sand Point, Idaho, Seattle, Arrowhead, B. C.

Naugle Poles

Insure Your Overhead Lines
BY SPECIFYING
MacGillis
NORTHERN or WESTERN
CEDAR POLES
PLAIN or BUTT-TREATED
FROM
MacGillis & Gibbs Co.
120 E. Wisconsin Avenue
MILWAUKEE - WISCONSIN

Bell Cedar Poles
Piling & Ties
Western Red - Northern White
Creosote Butt Treating—Any Specification
Guaranteed N. E. L. A., W. R. C. A., N. W. C. A. Grades
Treating Plants and Concentrating Yards
Minnesota Transfer, Minn., Newport, Wash.
Other Concentrating Yards at British Columbia Points
There Are No Better Poles Than Those Produced by
BELL LUMBER & POLE CO.
Security Building Minneapolis, Minn.
Long Distance Phone Atlantic 2304

Takes the place of 6 men . . .
Simplex Pole Jack



Templeton, Kenly & Co., Ltd.
Sole Manufacturers
Established 1899 Chicago, Ill., U. S. A.

Cedar Poles
Northern White Western Red
Plain or Treated Butts
Prompt Shipment from Minneapolis Yard.
T. M. Partridge Lumber Co.
Minneapolis, Minn.

necessary to prevent low pockets accumulating water which in extreme cold climates may freeze and there has been cases where the compression from freezing has ruined sections of cable. However, regardless of climatic conditions dry ducts are much to be desired and should be obtained if possible. The duct line should slope either from one manhole to the other or from a central point to each manhole as indicated in Fig. 4. A drop of not less than six to eight inches to each 100 feet should be obtained and more is to be desired if possible.

Concrete.

Concrete for underground conduit construction is prepared in a manner very similar to that used in all building construction. Concrete is made from a mixture of portland cement, sand, stone and water. The proportionate amount of each will depend on the strength required of the finished product. When a good mixture has hardened properly in forms it is almost as hard as stone. In the making of good concrete sand and stone should be mixed in proportions that will reduce the size of the space or voids between the particles as much as possible. Also all stones should be coated with a film of cement and good concrete does not contain air pockets.

Portland cement is manufactured from a mixture of ground limestone rock and a clayed earthen matter. This mixture is placed in a kiln over intense heat which causes the two substances to form a clinker. These clinkers are then ground to a fine powder which gives us portland cement. Cement generally comes packed in paper or cloth sacks each weighing 94 lbs. net.

Sand and broken stone sometimes called "Aggregate" are used as binders in concrete work and of course cheapen the cost. Rock that will go through a ¼-inch screen is called fine aggregate and from ¼ to 2-inch stone is called coarse aggregate.

As with many other things the opinions of telephone men differ greatly as to the amount of each ingredient to use for a satisfactory concrete on conduit work. Most agree, however, that a good mixture must be used on manholes and generally 1 part cement, 2 parts sand and 4 parts rock are used for this purpose although some consider that a 1:3:5 mixture is sufficient.

"Baby Digger" at work. Showing possibilities of speed when machinery is used. Illustration courtesy Cleveland Trencher Co., Cleveland, Ohio

It is true that a concrete envelope placed around conduit is generally not called upon to withstand any strain and its use is purely a mechanical protection.

Fig. 5—Pouring concrete in conduit line

In locations where the conduit line may settle or under streets that will be rolled and paved later, the conduit line may be called upon to carry a heavy load the concrete should be of a good mixture and may be necessary even to reinforce it with iron rods. In the average conduit location, however, a cheap mixture is all that will be required. Frequently "run of crusher" stone can be obtained that contains enough small particles of rock to pack well and no sand is required for conduit concrete. In most cases bank run gravel is found to contain enough sand that it can be mixed with cement and used for this purpose. Gravel used in manhole construction should always have the sand screened from it so that proper proportions of each can be used.

After the cement, sand and rock have been mixed thoroughly dry, the water should be added slowly until it reaches a jelly-like consistency. Never add too much water as it causes the concrete to shrink and may also weaken it.

Cement mortar for sealing the joints of clay conduit is made from a mixture of one part cement to two parts fine sand and mixed with water until it reaches a point at which it will trowel easily. Concrete should be poured within an hour after it is mixed with water and mortar used within 30 minutes.

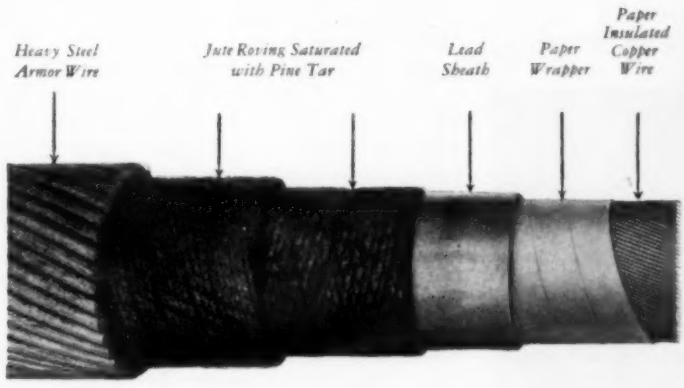
Great success has been achieved in telephone work by mixing the concrete at some central point and then hauling in trucks to the point used. This keeps much of the clutter out of streets which is always desirable.

Concrete work should never be attempted in cold weather where it can be avoided but there are times when telephone companies cannot arrange all such work for the summer months and it must be undertaken during the winter. In cases of extreme cold it is best to heat the sand and stone before mixing with cement and warm water. The concrete should then be poured in the forms quickly and covered with canvas and straw to retain the heat. Some add salt to the mixture in cold weather but I am of the opinion that in some cases this weakens the concrete.

In many cases a water tight mixture is desired especially in manholes located in low swampy ground. When such construction is desired fine aggregate only should be used so that there will be practically no voids in the concrete. There has lately been placed on the market a metal base paint which can be sprayed on concrete walls to make them water tight. This was developed for swimming pools and basements but is ideal for manholes where a water tight job is desired.

Directors of the Pacific Telephone and Telegraph company have voted to issue $87,500,000 in additional stock. The basis of the offering to stockholders has not been determined.

Protection for Submarine Telephone Cable



An example of the care with which Western Electric Telephone Apparatus is made ➢ ➢

You use submarine telephone cable oftener than you realize. For it is through this cable that the voice travels under many rivers, bays and other bodies of water.

In this service, cable must meet conditions which are more severe than those encountered by either underground or overhead cable lines. To withstand crushing pressure, corrosion, abrasion and to keep out water—which would interrupt your conversation—the wires in the cable are encased in six separate layers of protective material. But still more important is the *invisible* armor—the experience and careful workmanship which are built into all Western Electric apparatus.

The greatest pains are taken in producing even the tiny switchboard lamp which flashes your signal to the operator—the sensitive carbon button in the transmitter of your telephone—the many thousands of intricate parts which this Company makes as its share in good telephone service.

Western Electric

MAKERS OF YOUR TELEPHONE

G. A. Yanochowski New Kellogg President

The Kellogg Switchboard & Supply Company, pioneer telephone and radio manufacturers of Chicago, announces the election of Mr. G. A. Yanochowski as president, succeeding Mr. W. L. Jacoby, who died recently. Mr. Yanochowski has been associated with the Kellogg Company for the past fifteen years, entering the service of the firm in 1915 as an assistant to the head of the Legal Department. In 1925 he took complete charge of the Kellogg Legal Department and served in that connection until his appointment as president.

G. A. Yanochowski, new president Kellogg Switchboard & Supply Co.

Mr. Yanochowski studied electrical engineering at the University of Illinois. Upon leaving the University, he became connected with a telephone manufacturer. Starting at the bottom, he first worked in the factory and later took a student's course in the manufacturing plant to become familiar with the business, after which he worked as a telephone switchboard installer and maintenance engineer.

After several years of experience as a maintenance and installation engineer, Mr. Yanochowski was offered an opportunity in the Patent Department of the firm with which he started. There he familiarized himself with the legal division of the telephone business.

In 1915 Mr. Yanochowski became identified with the Legal Department of the Kellogg Switchboard & Supply Company. He took up the study of law and was admitted to the Illinois State bar in 1919.

For the past five years Mr. Yanochowski has been in direct charge of the Kellogg Legal and Patent Department. This work has brought him in close touch with the various departments of the business, both administrative, production and engineering, and for the past three years he had practically daily association with the president, assisting him in matters of major importance. His election to the presidency of the Kellogg Company was the logical and unanimous choice of the Board of Directors.

Independent Telephone Industry to Spend Millions in 1930

A survey among the leaders in the independent telephone industry, recently conducted by Kellogg Switchboard and Supply Company of Chicago, shows a vast amount of optimism in that field concerning prospects for 1930. Practically every independent operator is planning improvements in plant and equipment which, for the whole industry, will run into millions of dollars.

In conducting this survey, heads of the leading independent telephone companies in every section of the country were asked to give their opinions regarding the outlook for 1930. Furthermore, they were questioned regarding their own plans for the development and rehabilitation of their properties during the twelve months just ahead.

The replies indicate great optimism as to the outlook and ambitious plans for improvement of service. Every one agrees that 1930 will be a year of considerable expansion and that much of the plant improvement work left undone for the past few years will be carried out in 1930.

One man expressed the opinion that the United States was entering an era of greater prosperity for those who supply the nation's telephone service.

Another leader who is president of one of the largest state independent telephone associations said that millions would be expended for improvements in his state during 1930.

A large operator located in a section of the country that has not been particularly prosperous for the past few years says that he expects to secure a considerable amount of new business in 1930.

The president of a company operating in a section serving prosperous rural districts discusses the need for a higher type of rural telephone service. He says that his company expects to show material progress in the improvement of its farm line service during the year.

Another company operating in a prosperous agricultural section will spend two million dollars in 1930 for plant additions, new buildings, and so forth.

The manager of a vast independent telephone syndicate says that his concern plans to scrap a great deal of obsolete and outgrown equipment within the next few months, replacing it with the very finest equipment to be had.

Two leaders located in the southwest both state that their construction program and plant expansion plans for 1930 will exceed anything they have attempted to carry out the last few years.

It is a fact, not generally known, that independent telephone companies control approximately twenty-five per cent of the telephones of the country, with a capital investment running well over a half billion dollars. In the past few years, this important division of the nation's communication network has made great headway in offering adequate service to its subscribers. Improvements planned for 1930 indicate a determination on the part of the independent companies to furnish telephone service on a par with the best to be had.

It is said that the independent telephone industry was never in a more healthy condition.

Automatic Phones Installed in Egypt

Cairo.—Egypt's telephone operators are about to be replaced by automatic telephones.

Installation of the necessary apparatus has now started in the newly built telephone headquarters here and it will take approximately a year to complete the work.

The necessity for this step has long been apparent because of the many languages current in Egypt. The operators must speak four languages and count in still others. It is not always easy in this polyglot community, to find workers with such linguistic abilities.

The Egyptian telephone system in spite of this handicap, ranks in efficiency with the best systems in the world. One exchange in Cairo is the busiest in the world—the number of calls, that is, per operator.

Crapo
Galvanized Products
Telephone and Telegraph Wire
Steel Strand

A sleet storm.... Miles of line down.... Wire stocks inadequate .... Rush shipments imperative.... Then look to Jobbers of *Crapo* Galvanized Wire and Strand.... You can depend upon them in every emergency....and they, in turn, can depend upon us....for they know from experience that RUSH orders received by us in the morning are shipped before night....

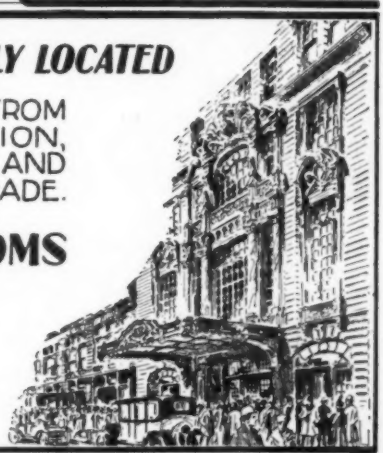
Indiana Steel and Wire Company
Muncie, Indiana. U.S.A.

HOTEL ATLANTIC
Famous for food
CLARK ST. NEAR JACKSON BLVD.

MOST CENTRALLY LOCATED

ONE BLOCK FROM LASALLE STATION, POST OFFICE, AND BOARD OF TRADE.

450 ROOMS
$2.00 UP
WRITE FOR FOLDER



CHICAGO

STORMS AHEAD?

not for copperweld drop wire!

They mean nothing to this sturdy twisted pair insulated drop wire. Neither does snow, heat, frost or high winds.

Copperweld is stronger than either steel and copper alone. Its insulation is high grade rubber, cotton braided, and waterproofed—to Graybar specifications.

With Copperweld one need never worry about storms to come. Copperweld is built to "ride the gale."

GraybaR

Distributed by GRAYBAR

THE GRAYBAR TAG—SYMBOL OF DISTRIBUTION

Tune in on the Graybar hour, 10 to 10:30 Eastern Standard Time, every Tuesday night . . . Columbia Broadcasting System.

Selects Stromberg-Carlson Equipment

Griswold (Iowa) Telephone Company Adopts Stromberg-Carlson Company's Two Position Magneto Switchboard and Equipment for Griswold Exchange—By H. T. McCaig, Assistant Manager of Stromberg-Carlson Chicago Office.

About the time that other communities in the central west were being organized for the purpose of securing adequate telephone service, a group of men living in and around Griswold, Iowa, organized the Farmers' Mutual Telephone Company. This group included business men and farmers. They began operations in a modest way, but on account of the demand for service soon found it necessary to expand their program materially, so that in a very short time, service was being furnished over the Griswold switchboard to all of the normal trading territory of that enterprising town.

By 1913 the originally installed equip-

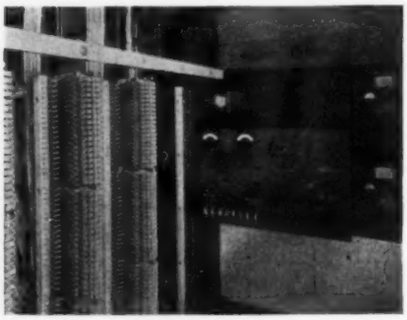


Fig. 1

ment had reached the point where replacement was necessary both through the wear, incident to many years of heavy traffic, and the inadequacy of the equipment. In making replacement at this time, quite a careful survey of the situation was made resulting finally in the purchase of a Stromberg-Carlson two-position magneto switchboard equipped for harmonic ringing and having associated with it other central office equipment designed to assist in giving a very good grade of service. Duplicate sets of 24-volt storage batteries, mercury arc rectifier, slate power panel, and a complete wiring system the equal of many common battery plants was installed.

This equipment served the Farmers' Mutual Telephone Company for a number of years, during which time the service was improved by additions to the plant and by replacements of several units of plant construction.

A few years ago, following a complete valuation of the plant, a reorganization and change of name was effected, at which time the name Griswold Telephone Company was adopted in place of the Farmers' Mutual Telephone Company.

Shortly following this, plans were begun looking toward the introduction of Common Battery service. These plans finally were culminated in the placing of a contract with the Stromberg-Carlson Telephone Mfg. Company for complete Junior Multiple Central Office equipment.

A part of the program adopted by the Griswold Telephone Company in thus modernizing the Griswold plant was a transfer of the Central Office activities to larger and more modern quarters. A suite of rooms in the Citizens' State Bank Building was secured where the arrangement of the rooms is almost ideal for the purposes of a telephone plant of this size. Inspection of the floor plan drawing accompanying this article will demonstrate this thought quite conclusively to the reader. It will be noted that ready access may be had to the operators' rest room without the necessity of traversing the operating room. Thus, operators may come or go from work without disturbing the quiet of the operating room.

The public may enter the operating room and yet not interrupt the service because of the counter installed between the switchboard proper and the space reserved for the public. As both the terminal room and the shop have entrances off the corridor, either of these rooms may be entered without passing through the other. The size of the rooms and their relative locations are such as to fit them remarkably well for the purposes assigned, since only short cable

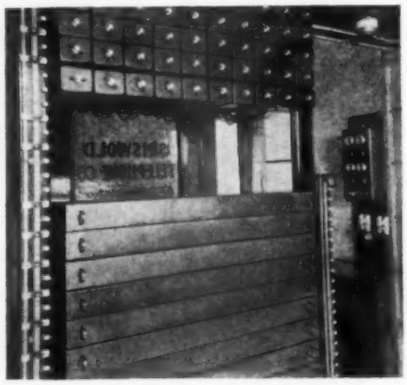


Fig. 2

runs and power leads are required to connect the various pieces of apparatus.

The equipment of this exchange is most complete, resulting in an installation which is probably the best for its size in the state of Iowa. Through the use of an ampere hour meter, control of the charging and discharging circuits is effected automatically. Two Tungar Rectifiers are provided as sources of charging current supply, one of these handling the load on a practically continuous basis while the other is called into service if any unusually heavy demand is made upon the power supply circuits.

Complete harmonic converter apparatus in duplicate furnishes a never-failing source of 4-frequency selective ringing current.

Photographs taken shortly after the installation was completed are reproduced herewith, in which our readers will see pictures of the relay racks and the power equipment. Since the pho-

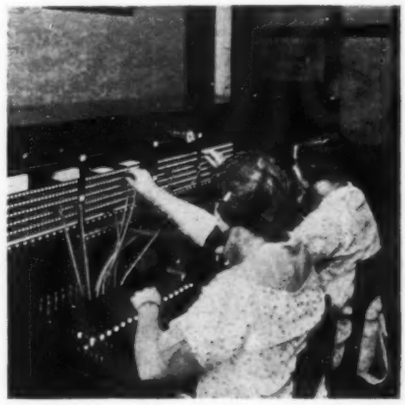


Fig. 3

tographer had to place his camera close to the apparatus, the views are not exactly works of art, but to the telephone man they tell an interesting story.

View No. 1, showing the power panel and a part of the main distributing frame, will give a very good idea of the way in which the power and ringing machine circuits are controlled and also indicates the method of mounting the ampere hour meter used in controlling the operation of the two Tungar Rectifiers seen at the extreme right. In the lower part of view No. 2 are seen the line and cut-off relays of the local, or common battery, line group. Above these are seen the toll and rural line relays. The rural line circuit is an especially interesting one, since it embodies several unique features. In the first place, it is a convertible circuit so that, should the subscribers of any given

4300 Clarendon Avenue

TRANSIENT HOTEL ROOMS AND FURNISHED APARTMENTS

A Refined and Exclusive Residence for those who Come to Chicago

Near Lake Michigan and Lincoln Park
Away from the noise and turmoil of the business district, yet within fifteen minutes from the Loop ~
Most convenient transportation

WRITE FOR ILLUSTRATED FOLDER

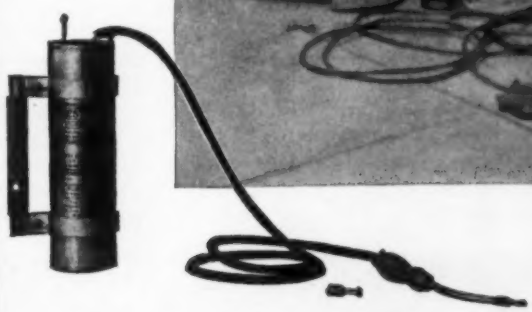
KNOWN FOR GOOD FOOD
Famous Dollar Dinner Served Daily

TRANSIENT RATES
$2.50 TO $4.00 PER DAY
Reduced Rates by the Week

The Monterey
Apartment Hotel
4300 Clarendon Ave.
CHICAGO
Ideal for Women with Children Traveling Alone

OPERATED UNDER THE WELL KNOWN STILES MANAGEMENT

This workman is shown soldering connections in a street lighting installation with a handy little Prest-O-Lite M. C. unit.



Just as simple as it looks with a Prest-O-Lite Outfit

LIGHT and power companies use Prest-O-Lite equipment because of its economy, speed and convenience. It is always ready for service—instantly lighted for any heating job in the field or shop.

Workmen prefer the Prest-O-Lite torch outfit for its ease of handling and its adaptability to all soldering, brazing, splicing and heating operations. A Prest-O-Lite outfit assures the operator a job that is strong, smooth and permanent. Phone your nearest Prest-O-Lite Gas Distributor or write direct to us for complete information.

THE PREST-O-LITE COMPANY, INC.
Appliance and Small Tank Division

Equipment and tank exchanges can be had at any one of the 15,000 Prest-O-Lite Exchange Stations.

Unit of Union Carbide and Carbon Corporation

NEW YORK CITY
Carbide & Carbon Bldg.

SAN FRANCISCO
Adam Grant Bldg.

IN CANADA
The Prest-O-Lite Company of Canada, Ltd.
Toronto

Prest-O-Lite GAS

rural line decide to adopt the Common Battery method of operation, a few changes in the connections only need be made at the relay rack to switch this line equipment from use in connection with a magneto line to the proposed Common Battery line.

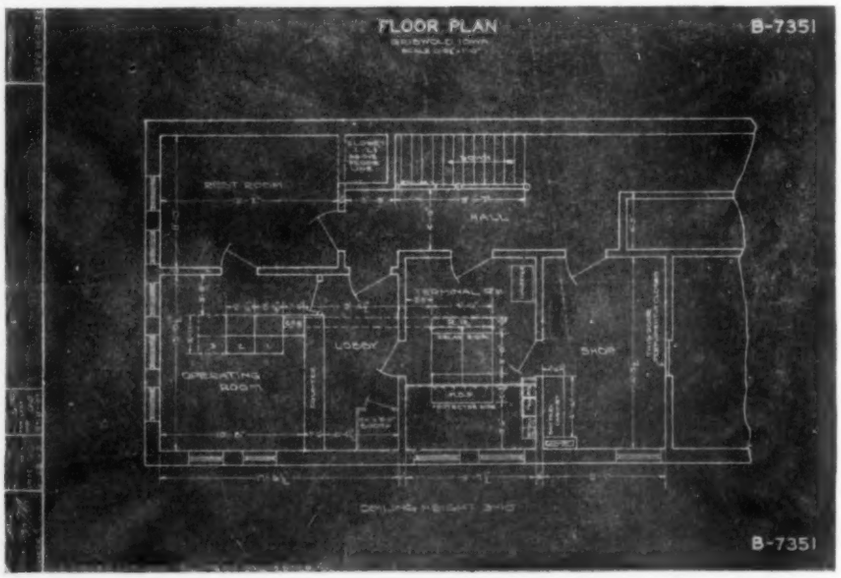
During the time that this line is operating as a multi-party non-selective magneto line, the line relay equipment will respond to the pulsations of current from the hand generators and in turn will transmit the long and short rings as a series of long and short pulsations of the lamp signal, thus indicating to the operator whether a subscriber is signalling her or some other subscriber on the same line. Should the call be for another subscriber on the same line, the operator extinguishes the lamp by depressing the push button key associated with the lamp and line jack rather than by going to the trouble of plugging in for that purpose.

Individual four-party selective keys are provided for each cord circuit and all cord circuits are fully universal so that an operator may answer either a common battery call or a magneto call and complete the connection to either of these classes of line without having to change cord pairs or go through any other process of adapting the cord circuit to the particular type of connection. In other words, they are completely self-adapting. Where the cord is used in connection with a Common Battery line, the lamp supervisory signal is immediately responsive to the manipulation of the subscriber's hookswitch. Where the cord is connected to a magneto line, the supervisory lamp is responsive to the alternating current provided by the hand generator of the connected telephone.

View No. 3 will give readers a comprehensive picture of the Griswold switchboard and the arrangement of face equipment. The Junior Multiple Switchboard of which this is a typical installation, provides for an ultimate capacity of 600 Common Battery lines, these lines being arronged on a 3 panel basis; that is, each Common Battery Line in the exchange appears once in every three panels. As will be noted in this installation, 100 of the total 300 installed lines is repeated so that each operator has to reach but one panel outside her own position to get in contact with every line on the exchange.

Shortly after cutting over to the new equipment, the Griswold Telephone Company held open house and entertained their subscribers and visiting telephone people. In the two days allotted to this house warming, several scores of patrons passed through the plant, inspecting it in detail, and a dozen or more surrounding exchanges were represented by delegations of visitors. Refreshments were served by officials of the telephone company, ably assisted by Miss T. Anne Barnes, Traveling Chief Operator of the Iowa Independent Telephone Association and Miss Crosby, District Supervisor for the Northwestern Bell Telephone Company. A profusion of flowers were sent by friends and admirers of the telephone company, so that altogether there was manifest quite a fine spirit of congeniality between the telephone company and the community it serves.

The affairs of the Griswold Telephone Company are under the control of a Board of Managers consisting of C. S. Tompkins, M. M. Meredith, N. R. Graham, James O'Connor and P. L. Arrasmith. Mr. O'Connor is serving as President, Mr. Graham as Vice President and Mr. Arrasmith as Secretary. Some of these men served in the same capacity with the Farmers' Mutual Telephone Company when its new equipment was installed in 1913. The intervening years have not served to lessen their activity nor dull their appreciation of the fact that they are charged with the responsibility of providing adequate telephone service to the Griswold community. They feel a keen delight in realizing that their company is numbered among the progressive smaller companies of the country which have not hesitated to inaugurate Common Battery service and to extend the benefits of the same to progressive communities which have already demanded and are getting the benefits of consolidated schools, hard roads, improved mail service and rapid transportation.



Floor plans for the modern exchange of the Griswold Telephone Company

Wise and Otherwise

Frank G. Switzer, general manager of the Harrisonburg Mutual Telephone Company, Harrisonburg, Va., writes us when renewing his subscription for several employes that "we find the TELEPHONE ENGINEER a most interesting and instructive magazine, for those having the operation, management and maintenance of telephone equipment in their charge. We quite frequently find answers to numerous questions and problems within its covers."

* * *

A Toronto wag is responsible for the following sign which was supposed to be posted on a church bulletin board: (Large Letters) "Do You Know What Hell Is?" (Small letters) "Hear Our New Organist Next Sunday."

* * *

Changing conditions put reverse English on the editor's job, even. In our early training we were told, in determining the news value of a story, that "if a dog bites a man, that is not news; but if a man bites a dog, that is interesting news." The idea was to impress upon us the importance of the unusual. Now they teach the young fellows that "when a bootlegger shoots an enforcement officer, that is not news, but when an officer shoots a bootlegger, that is shocking good news."

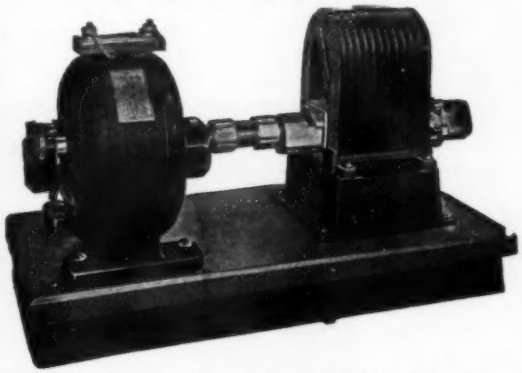
* * *

TELEPHONE ENGINEER is in receipt of a money order from the Dominion of New Zealand in the amount of 14 pounds, 3 shillings and 4 pence, covering seventeen additional subscriptions to that country. If we were a millionaire we would keep some of these foreign money orders as souvenirs, but under the circumstances we feel impelled to exchange them for Standard Oil liquid assets for the maintenance of Lizzie.

HOLTZER-CABOT

Magneto - Ringing - Motor - Generators

ALWAYS DEPENDABLE



These units effectively replace all old-fashioned hand and battery ringing methods. Extreme simplicity of operation and low cost offer advantages over all other devices.

Cuts operating expenses by eliminating expensive and troublesome battery equipment.

Make possible a swift, sure, carefree service that pleases both subscriber and operating company as well.

Can be supplied for any voltage or special current. A thorough test will convince you.

Complete data and specifications on request.

HOLTZER - CABOT ELECTRIC CO.

125 Amory Street, Boston, Mass. — **6161 So. State Street, Chicago, Ill.**

KESTER FLUX-CORE SOLDER
FLUX IN POCKETS
SOLDER WALL
Ready to Use
Needs only Heat
KESTER SOLDER
Flux-Core
ECONOMY
Kester for economy. Saves the time and labor ordinarily spent in searching for, handling and applying a separate flux. Kester affords faster work and surer protection from current losses and increased resistances. Use Acid-Core for outside lines and Rosin-Core for delicate work, or write to our experimental department for the particular solder most efficient for your needs.
From all Jobbers.
Kester Solder Co., 4218 Wrightwood Ave., Chicago, Ill.
Established 1899—Formerly Chicago Solder Co.
KESTER
FLUX-CORE
SOLDER
ACID-CORE
ROSIN-CORE
PASTE-CORE
METAL MENDER
RADIO SOLDER

The Height of

PROGRESS

is marked by the

Chance Expanding All Steel Anchor

MANUFACTURED BY

Chance Company

CENTRALIA, MO.

To Reach the Man Who Does the Buying Advertise in

TELEPHONE ENGINEER

With the Manufacturers

A Unique Cut-Over

Tuesday, December 17, the operators for the Middle States Telephone Company at Havana, Ill., left their places at the antiquated switchboard, which had done service in Havana for more than a decade, and took their positions at the Kellogg Service switchboard installed in the new modern building.

No service interruption was experienced by the subscribers, as an entirely new common battery plant had been built including the switchboard, telephones, building, lines, poles and even the arresters. Not a part was used from the old magneto system.

Calls poured into the office during the noon hour Tuesday equal to the peak loads of the company's busiest days. Every one in town seemed curious to put in a call and find out how the new system worked.

It was a gala day for the management, and the operating room was in keeping, decorated with a profusion of potted plants and beautiful cut flowers. Those present at the "change-over" were: R. H. Coyne, Chicago; M. A. Bellion, Chicago; Charles Ruge, Chicago; Hugh Hogue, Chicago; Albert Parlett, Chicago; Winn Rodormer, Park Ridge; R. F. Pagels, Park Ridge; Duane Heath, Lacon; W. S. Green, Pekin; J. C. Poole, Pekin; Miss Marion Hardman, Pekin; Miss Artie Palmer, Pekin; H. F. Cox, Pekin; H. A. Seamark, Peoria; Dewey Risen, Green Valley; J. O. Higgs, manager.; Miss Edna Saurer, chief operator.

The telephone management, after a very complete survey, decided to build an entirely new common battery plant and scrap the magneto one. An order was placed with the Kellogg Switchboard and Supply Company for a four position steel frame full feature service switchboard. This board was equipped with 600 common battery lines, 20 toll lines, 20 rural lines and 20 pay station lines.

In addition, they placed an order with the Kellogg Company for all the telephones, poles, line supplies and so forth necessary to build the entire new exchange. It might truly be said that here is a plant that is 100 per cent Kellogg equipped and the protection of which is 100 per cent Reliable Electric.

The management certainly did everything it could to insure the 1000 telephone subscribers uninterrupted service even through the worst sleet storms. Some 25,000 trench feet of underground vitrified clay conduit was placed. All new terminal poles were set to allow for the most modern method of distributing subscribers' "drops." Latest type cable terminals were installed and everything used was the last word in telephony.

Popular Executive Joins Valentine-Clark Organization

The Valentine-Clark Company is pleased to announce the appointment of Mr. M. H. Sperry as vice-president in charge of sales, service, and public relations with headquarters at the general offices, 2516 Doswell avenue, St. Paul, Minnesota.

Mr. Sperry is well known to the trade, having been identified with the cedar industry since 1907, at which time he was in charge of the pole department of the Kellogg Switchboard & Supply Company. When the Kellogg Company disposed of its pole yards in 1910 Mr. Sperry joined the MacGillis & Gibbs Company of Milwaukee and has been intimately identified with the latter firm for over nineteen years, rising through the offices of assistant secretary, secretary, and being vice-president in charge of sales for the MacGillis & Gibbs Company from 1920 to date.

The Valentine-Clark Company is one of the oldest cedar pole companies in the field having been established in 1890 and continuing under the management of E. L. Clark until his death in November, 1929. Mr. Sperry completes the organization and the Valentine-Clark Company will continue business as usual.

All contracts for yarding and commercial treating were matured on December 31, 1929, and the Valentine-Clark Company will devote their time to the production and distribution of quality poles through their large assembly yard at Minnesota Transfer where they operate one of the largest and most efficient butt-treating plants in the cedar industry.

McCannes to Tour Europe

W. Roy McCanne, President and General Manager of the Stromberg-Carlson Telephone Manufacturing Company of Rochester, New York, and Mrs. McCanne and Mr. and Mrs. Lee McCanne sailed for a three months' tour through Europe January 25 on the S. S. Carenthia.

During their travels the McCannes will take a cruise on the Mediterranean Sea and will make an automobile tour through Southern France and Italy. The party will also visit the Holy Land and later will tour England.

They will sail from England for the United States and will arrive here April 15.

Battery Companies Consolidated; Frank Eldridge Remains "On the Job"

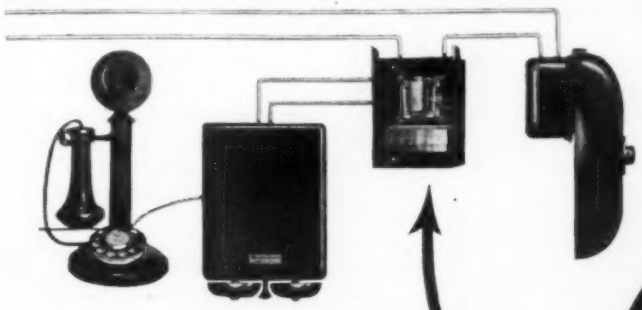
The Chicago office of the Carbon Products Company, which has been under the management of Frank L. Eldridge, vice-president in charge of telephone and railway sales, and located at 11 South LaSalle street, has been merged with the Chicago office of the Bond Electric Corporation, located at 2339 South LaSalle street, and Frank will be found at the latter address, where he still deals in smiles and good batteries. The move is a result of the consolidation of the Carbon Products with the Bond Electric Corporation of New Jersey.

Frank L. Eldridge, Battery Salesman DeLuxe, Now Located at 2339 S. LaSalle Street, Chicago.

Mr. Eldridge retains his relations with the new organization as salesman for the battery business in the telephone and railway fields. Frank has hundreds of friends throughout the entire telephone industry who will be glad to learn that he will remain in the industry, and who will give him the "glad hand" when he is in their territory.

Jas. R. Kearney, Jr., Made Vice-President Jas. R. Kearney Corporation

At the annual meeting of directors of the James R. Kearney Corporation, St. Louis, Mo., February 4th, James R. Kearney, Jr., was elected to the position of vice-president of that organization. He could doubtless be classed as one of the youngest executives in almost any line of industry, and yet the organization of which he was made vice-president is fast becoming one of the largest anchor manufacturers in the United States.



SIGNAL ENGINEERING

LOUD RINGING TELEPHONE SET

Loud ring bell (or horn) operates on lighting circuit.

Relay operates on standard ringing current closing contact for bell or horn.

SIGNAL
ENGINEERING & MFG. CO.
152 WEST 14TH ST., NEW YORK

BRANCHES—Boston, Detroit, Seattle, Chicago, Los Angeles, San Francisco

Relay with condenser urnished in weather-proof or non-weatherproof housing.

TELERING

For Central Office and PBX Ringing

ONE REED!

ONE CONTACT!

IDEAL WAVE FORM

ORDER ONE ON TRIAL.

NO OBLIGATION TO KEEP.

Fully Guaranteed

Converts 60 Cycle Lighting Current to 20 Cycle Ringing Current.

POSITIVELY NO RADIO INTERFERENCE

Very low current consumption.

Model EX-3 has been proven the ideal ringing machine by hundreds of satisfied users.

Price $44.00—F. O. B. Elyria

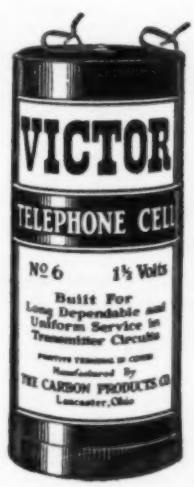
IT PAYS FOR ITSELF

Sold by Leading Telephone Distributors

Telkor, Inc., Elyria, Ohio

(Write for booklet)

VICTOR TELEPHONE CELLS



The standard cell of the independent telephone industry. Uniform in quality. Dependable in service.

The Carbon Products Co.
LANCASTER, OHIO

11 South La Salle Street, Chicago

Identify your inquiry to advertisers by saying—"As shown in TELEPHONE ENGINEER"

Book Review

Transmission Networks and Wave Filters. By T. E. Shea. Price, $6.50.

The present book is another of the authoritative series of treatises that have been the result of after-hour courses in the Bell Telephone Laboratories. Like its companion books, it takes up one phase of telephone development and treats it exhaustively. In no other place has been accumulated as extensively as in the Bell Laboratories, the knowledge of the effects of networks of resistance inductance and capacitance in electrical circuits. In no other art has their use for practical purposes been as extensive as in the communication art. It is therefore fitting that the author, a member of the Laboratories staff, should present a text on this subject which collects the vast amount of information that has been gained.

The book is divided into three parts, the first dealing with principles of transmission networks, the second with electric wave filters, and the third with composition of waves. The introductory chapter is a general discussion of the place of transmission networks in systems of electrical communication and a reading of that chapter is sufficient to acquaint one with the importance of the subject. The section on networks comprises four chapters dealing with principles of networks, external performance and conditions for network equivalences, effect of impedance mismatching at tereminals including reflection and interaction factors, and properties of two-terminal impedance arms. The second section deals with electric filters and the principles and design of various types. The two sections of Part III deal with compositions and resolution of steady state and transient waves.

A very complete bibliography of the subject is given in appendix A while appendix B gives the relations between decibels and current, voltage and power ratios.

The treatment is necessarily mathematical but a reader who retains a reasonable knowledge of the fundamental theory of electrical circuits will find little difficulty with most of the mathematics. The book is a valuable addition to the literature of communications as it gathers material that heretofore has been available only in the form of scattered articles and combines it in the form of a logical and consistent treatment of the subject.

Gifford Urges Phone Boost

Washington.—The telephone monopoly is aiming at rates that will increase its profit to 8 per cent on the value of its properties, Walter S. Gifford, president of the American Telephone & Telegraph Company, disclosed today.

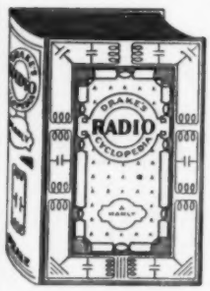
Rates the federal court decision in the New York case appears to require will yield only 7 per cent, according to Gifford. But 8 per cent, he declared, is the only "safe" figure to represent an "adequate return."

Testifying before the Senate interstate commerce committee, Gifford said it was a hardship on the company to have to raise rates. "But of course," he added, "the company must get money enough to run the business."

Gifford opposed federal regulation of communications and sought to avoid questions by Senators Wagner, Dill and others, regarding Wagner's bill to require review of state commission decisions in state courts before the utilities rush into federal courts.

Oklahoma Association Changes Meeting Place

The Oklahoma Utilities Association announces that the convention will be held at the Tulsa Hotel, Tulsa, Okla., March 11, 12 and 13 instead of the Hotel Mayo, Tulsa, as had been formerly announced. The change was necessary because of the fact that another convention was scheduled for the Hotel Mayo on the same date of the Oklahoma Utilities Association.



DRAKE'S RADIO CYCLOPEDIA
By HAROLD P. MANLY

A Complete and Non-technical Reference Work, covering nearly 1700 subjects arranged alphabetically, including instructions for building, operating and testing receivers, power units and radiophone equipment. Arranged for use by set builders and designers, service and repair men, dealers and salesmen, experimenters and students, set owners and operators. 871 Pages. Size 6x9". 985 Illustrations. Circuit Diagrams, Constructional Layouts and Graphic Curves. All made especially for this book. Bound in Art Buckram. Stamped in Two Colors. Price $6.00

Send Order Direct to

TELEPHONE ENGINEER
192 N. Clark St., Chicago, Ill.

Get EVER-PROTECT aid in your construction.

EVER-PROTECT has proved practical and profitable in making many hundreds of cable installations underground without a conduit. It protects cable against storm damage, corrosion, chemical action, electrolysis and abrasion.

In liquid form EVER-PROTECT is great for overhead work, protecting your cable and messengers against chemical action and other destructive influences.

Ask your nearest jobber for complete details.

EVER-PROTECT CABLE COMPOUND
TRADE MARK REG U S PAT OFF

National Cable Compound Co.
Incorporated
MITCHELL - - IND.

For Every Job

Dependable battery operation is imperative to uninterrupted telephone service.

Exides are dependable. Thirty-five years of service in the telephone industry have proven that. Dependable Exides assure a long life of satisfactory service.

DEPENDABLE EXIDE BATTERIES

Exide BATTERIES

The Electric Storage Battery Company
Philadelphia Penna.

Note Protection at Corners

Blake Insulated Staples
Trade Mark

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

Blake Signal & Mfg. Co.
BOSTON, MASS.

J. B. Earle Dies at His Home in Waco, Texas

J. B. Earle, of Waco, Texas, died at his home in that city, Saturday, February 8th, after an illness of only a short duration. Mr. Earle had suffered from asthma and a weak heart for some time, but his condition was not considered serious until during the latter part of January, when his condition took a more apprehensive turn, and his family became alarmed.

Mr. Earle has for a number of years been a director and vice-president of the United States Independent Telephone Association and active in the councils of the organization. He was formerly president and principal owner of the Texas Telephone Company at Waco and a number of other Texas cities. Several years ago this property was transferred to the Gary interests at Kansas City, and Mr. Earle's only telephone property in recent years was the Texas Long Distance Telephone Company with headquarters at Waco. He was engaged in banking in Waco and controlled other properties in Texas.

Telephone Men of South Dakota Meet

South Dakota held its annual convention in Watertown, South Dakota, January 14, 15 and 16. The severe cold weather undoubtedly reduced the attendance of its meet. Nevertheless, a fair sized group of enthusiastic telephone men attended this meeting.

The address of the president was brief but covered conditions in South Dakota fully. He said: "The past year in the telephone industry of the state has been a normal year. Much improvement in the various exchanges has been made. New buildings have been created and several exchanges have been rebuilt. Long distance facilities have been increased. Toll rates have been somewhat reduced."

At the annual election of officers the old officers were re-elected as follows:

Grant E. Preston of Hitchcock, president; H. M. Schumacher of Alexandria, vice-president, and Thomas Phalen of Aberdeen, secretary-treasurer. The new executive committee of the association consists of H. M. Schumacher of Alexandria; W. W. Straight of Crooks; F. R. Irons of Chamberlain; Ira S. Barnett of Armour; W. J. Brazell of Aberdeen; D. T. Patterson of Sioux Falls, and Grant E. Preston.

Studying Telephone Methods

(*Continued from page 20*)

shows its worth. The tone can be connected to the grounded terminal, and then with the hooked exploring coil and the receiver the tone can be followed down to the bank where the trouble is. Since these troubles are due largely to bits of solder, or bent springs, the trouble can be located and cleared without cutting or unsoldering any wires from the back of the line switch banks.

Where more than 100 trunks are needed to carry the outgoing service, the jumper cable can be unsoldered and the upper contacts on the right hand side soldered down. Then with these trunks wired to switches, and an extra master switch supplied, the 100 lines may be divided into two groups, using two separate sets of out trunks. This is sometimes used where it is desired to have some telephones given full access to all the lines of the board, while others are given a limited service. The connectors of say the left hand group might have access to say 90 telephones connected to this 100 line board, and to one level leading out to another exchange, through special trunks connected to say the top or "O" level of these connectors. Then the telephones on the right hand group may be given service only to the 90 telephones of the 100 line group, while the "O" level is not connected to the connector banks of the right hand group. For your own information draw out the arrangement of terminals required to connect section "A" so that these telephones receive full service, while the remaining telephones on sections "B"-"C" and "D" have only the limited service.

FOR SALE

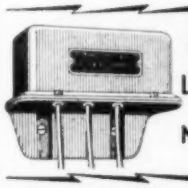
New twisted pair drop wire, No. 14 copper, $12.00 per 1000 feet. New Cook 86 cable terminals, 10 pair with stub, $8.00. Bakelite mouth-pieces for W. E. transmitters, $6.00 per 100. 2 groove porcelain knobs, $10.00 per 1000. 4 groove porcelain knobs, $20.00 per 1000. New black silk receiver cords, 26 inch. 15c.

The Telephone Repair Shop
6966 Ravenswood Avenue
Chicago, Ill.

We will sell your
Telephone Directory ADVERTISING
or will publish your directory complete
L. M. BERRY & CO. DAYTON, OHIO

Make Your Directory a Source of Income
Write for Particulars
J. H. WELKER
McKinley Block, Canton, O.
Telephone 8009
DIRECTORY ADVERTISING EXCLUSIVELY

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies.
J. G. Wray, Fellow A. I. E. E.
Cyrus G. Hill
Rm. 2130 Bankers Bldg., Chicago


CHAPMAN
LIGHTNING ARRESTERS
MADE BY
MINNESOTA ELECTRIC CO
MINNEAPOLIS, MINN.

EARL L. CARTER
CONSULTING ENGINEER
814 Continental Bank Bldg. Indianapolis, Ind.
Special attention given to all matters pertaining to Valuations and Investigation of Public Utility Properties.
Formerly Chief Engineer, Public Service Commission of Indiana

ACCOUNTING
Specialization on Public Utility Accounting Records and Audits enables us to best serve Telephone Companies.
HERDRICH AND BOGGS
Certified Public Accountants
901-7 Continental Bank Bldg., Indianapolis, Ind.

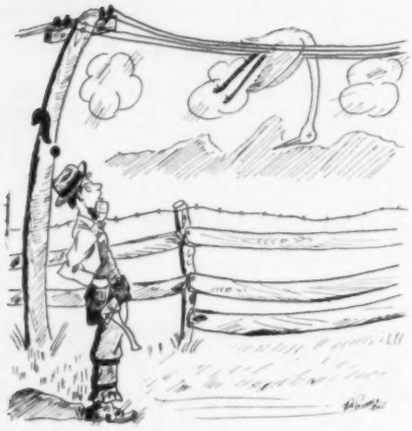
TRAVELERS select the Great Northern for its wonderful location in Chicago's "loop". They return because the large comfortable rooms, homelike environment, attentive service, excellent food and moderate charges make it an ideal hotel.

400 Newly Furnished Rooms
$2.50 a day and up

Sample Rooms
$4.00, $5.00, $6.00
$7.00 and $8.00

Dearborn St. from Jackson to Quincy
New Garage One-Half Block

TELEPHUNNIES



In a small town which boasted of two telephone exchanges under different management, Bill worked for one of the companies and after consolidation of the two he kept his job.

He was a trouble shooter but knew very little about toll line testing since the company he had been with owned no toll lines. Consequently he was rather skeptical when the toll wire chief, of the one time rival company, told him that he could measure the distance to trouble.

However he couldn't make Bill swallow anything like that because as Bill told him, he had worked several years for a telephone company and whenever a line got in trouble the only way to locate it was to start out and find the fault with the naked eye.

Soon after this, it happened that the district plant chief was riding along via train to this particular town and noticing a dead crane mixed up in a toll lead into which it had flown and had been killed, he made a note of the fact and upon arrival told the wire chief the location.

The wire chief saw that this was the time to make a believer of Bill and to do so he would have to be very impressive. With Bill watching very closely the chief made a number of tests and after much time stated that the line tested as though there were feathers on it. "In fact they test like crane feathers. I can determine the kind of bird on the line by the amount of conductivity in the feathers," he explained. "Some feathers have such high resistance that I can't determine the bird," he added.

Finally Bill was given the location and he started out to find the trouble. Upon arrival he saw the crane up in the lead, dead. After he cleared the trouble he called in and told the wire chief, "Well, I didn't believe you could do it, but you did, and when you can test and learn exactly what kind of bird it is—that beats all. Listen chief! If any geese hang in our lines when they start flying South I hope that meter can detect goose feathers."

—ERNEST WOMMACK.

Chilean Senate Approves Big Expansion in Telephone Service

New York.—According to announcement made here recently by the International Telephone and Telegraph Company, the Chilean senate has approved a new fifty-year concession to the Chile Telephone Company, which will assure an immediate and wide expansion of telephone service in that country. The Chile Company is a subsidiary of the International. It is the largest company operating in that country. Within a few months it will be connected with the station of the American Telephone and Telegraph Company at Lawrenceville, N. J., so that conversations between the United States and Chile can be had.

RECONSTRUCTED EQUIPMENT

Western Elec. No. 143 Receivers with cords @	$ 1.25
Western Elec. New No. 143 Rec. Shells with cap @	.37
Automatic Elec. Slip type receivers with cord @	1.10
Kellogg 3-bar 1000 or 1600 ohm Bdg. desk set with inside connection signal sets @ $10.00—4-bar $10.75—5-bar @	11.50
New Rebuilt Short type cabinet inside connection magneto compacts with Kellogg or Western Electric Transmitters & Rec., 3-bar 1000 or 1600 ohm $9.50—4-bar @	10.50
Kellogg No. 2696 type 4-bar 1000 or 1600 ohm Compacts @	8.50
Kellogg No. 6 Cordless P. B. X. board with 6 local lines and 2 trunks	50.00
Western Elec. No. 20 C. B. Ind. Coils @	.35
New Magnetizer for recharging magnets; works off 6-volt storage Batt.	6.25
Gray Desk or wall type 3-slot pay station @	5.75
Dean C. B. Steel hotel sets with straight line or 16-33-50 or 66 cycle ringers @	4.75

Write for Our Bulletin

REBUILT ELECTRIC EQUIPMENT CO. Not Inc.
1940 W. 21st St., Chicago

Common Battery Oak Residence Type Wall Sets

Kellogg F-729-SA straight line ringers $5.75

Kellogg F-729-HA or HB harmonic or syncromonic ringers $6.25

Leich Elec. Co. 29-A induction coil type, straight line $4.50

Leich Elec. Co. 29-C harmonic or syncromonic $5.00

Buckeye Telephone & Supply Co.
COLUMBUS, OHIO

FOR SALE

4-Position Western Electric Co.—1248 Common Battery Lamp Switchboards, equipped for 740 lines. One of these positions equipped with 15 pr. Universal Toll and Local Cord Circuits.

1—Mercury Arc Rectifier—10 Amp. Capacity.

1—Gasoline - Generator Set—24-36 Volt—20 Amp.

75—No. 294 Western Electric Co. Sub-s Sets, Less Receivers.

To move quickly this equipment can be bought cheap.

Petersburg Telephone Co.,
Petersburg, Va.

Send for free sample and prices on
UNIVERSAL DROP WIRE INSULATORS
Universal Specialty Company
711 Poplar St., Terre Haute, Ind.

UNIQUE
HEAT PROOF

BALANCED LADLE

Reduces Overhang to a Minimum

You pour the metal exactly where you want it. Drop by drop or in a stream!

The ladle cannot slip, twist or pull out of the *ventilated* handle.

Interchangeable—no holes to drill—a screw driver is the only tool required to attach or remove.

Bowl Diameters 2½, 3, 3½, 4"

GET ONE ON TRIAL

UNIQUE MFG. CO., INC.
221 Whiting St., Chicago, Ill.